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WAR DEPARTMENT

Annual Reports, 1912

(IN FOUR VOLUMES)

Volume II

Report of the

CHIEF OF ENGINEERS

(Without Appendices)

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ARRANGEMENT OF THE ANNUAL REPORTS OF THE WAR DEPARTMENT FOR THE YEAR ENDED JUNE 30, 1912.

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Chief of Staff.
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Inspector General.
Judge Advocate General.
Quartermaster General.
Commissary General
Surgeon General.
Paymaster General.
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Chief Signal Officer.
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Volume II............Chief of Engineers (without Appendixes).

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- Eastern Division.
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Volume IV..........Chief of Bureau of Insular Affairs.
The Philippine Commission.
Governor of Porto Rico.

ANNUAL REPORT

OF THE

CHIEF OF ENGINEERS,

UNITED STATES ARMY.

1912.

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WAR DEPARTMENT.

Document No. 427.

Office of the Chief of Engineers.

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REPORT

OF

THE CHIEF OF ENGINEERS.

UNITED STATES ARMY.

War Department,
Office of the Chief of Engineers,
Washington, October 8, 1912.

From: The Chief of Engineers.
To: The Secretary of War.
Subject: Annual Report.

I present for your information the following report upon the duties and operations of the Engineer Department for the fiscal year ending June 30, 1912.

OFFICERS OF THE CORPS OF ENGINEERS.

The number of officers holding commissions in the Corps of Engineers at the end of the fiscal year was 194, a net increase during the year of 4.

Since July 1, 1911, the Corps of Engineers has lost three of its officers—Col. Walter L. Fisk, who was retired from active service, upon his own request, on July 10, 1911, under the provisions of section 1243, Revised Statutes, after more than 37 years' service; Col. Thomas L. Casey, who was retired from active service, upon his own request, on March 1, 1912, under the provisions of section 1243, Revised Statutes, after more than 36 years' service, and Maj. Edwin R. Stuart, who was appointed professor of drawing at the United States Military Academy, and vacated his commission to accept the appointment on October 4, 1911.

There were added to the Corps of Engineers during the fiscal year, by appointment from civil life, one probational second lieutenant, whose commission dates from April 23, 1912, for a period of one year, and by the assignment of graduates of the United States Military Academy, six second lieutenants, whose commissions date from June 12, 1912.

On the 30th of June, 1912, the distribution of officers of engineers, according to their duties, was as follows:

Chief of Engineers, in command of the Engineer Department, etc	1
Assistants to the Chief of Engineers	7
On duty in the Office of the Chief of Engineers	2
River and harbor work and The Board of Engineers	1
River and harbor work and fortification work	16
River and harbor work, fortification work, and lighthouse duty	6

River and harbor work, fortification work, The Board of Engineers, and chief engineer officer, military division	1
River and harbor work, fortification work, The Board of Engineers, and lighthouse duty	1
River and harbor work	18
River and harbor work, fortification work, chief engineer officer, military division, and lighthouse duty	1
River and harbor work and lighthouse duty	6
River and harbor work and chief engineer officer, military division	1
River and harbor work and Fort Riley military reservation	1
River and harbor work and monument at Fort Recovery	1
River and harbor work and Vicksburg Military Park	1
River and harbor work, fortification work, with engineer troops, Hawaiian Islands, lighthouse duty, and assistant chief engineer officer, military division	1
Fortification work and chief engineer officer, Philippines Division	1
Fortification work, Philippine Islands	2
On duty with and under the Panama Canal Commission	11
On duty with the General Staff Corps	1
On duty at the Army War College	1
On duty at the United States Military Academy	11
On duty at the Service Schools, Fort Leavenworth, Kans	5
On duty at the Army Field Engineer School, Fort Leavenworth, Kans	1
On duty connected with the Twelfth International Congress of Navigation	1
With the government of the District of Columbia	3
Preparing plans for defense of Panama Canal	1
Public Buildings and Grounds, District of Columbia	1
At Engineer School, Washington Barracks, D. C., and with troops stationed there	32
On duty with troops at Fort Leavenworth, Kans	19
On duty with troops at Vancouver Barracks, Wash	3
On duty with troops in the Hawaiian Islands	4
On duty with troops in the Philippine Islands	11
Removal of the battleship *Maine*	2
With The Board of Engineers	1
Military attaché, Tokyo, Japan	1
Improvement of the Yellowstone National Park	1
Superintendent of the State, War, and Navy Building	1
Road work in Alaska	1
Under instruction in engineer district	5
Changing station	1
On leave of absence	2
On graduating leave of absence	6
	194

The above table shows that out of a total of 194 officers only 58, or approximately 30 per cent, were on duty wholly under the control of the Chief of Engineers; 53, or 27 per cent, more were performing some duty under the control of the Chief of Engineers, while at the same time performing other duties under various other branches of the Government; while 73, or 39 per cent, of the entire corps were on duty entirely detached from the control and supervision of the Chief of Engineers; in addition 1 was changing station, 2 were on leave of absence, and 6 were on graduation leave from the United States Military Academy.

With regard to the character of the duties performed, 57 officers were engaged on nonmilitary duty exclusively, 93 on military duty exclusively, while 34 were performing both military and nonmilitary duty. The diversified character of the duties assigned to the Corps of Engineers is well shown by this table.

An increase in the Corps of Engineers was provided for by Congress in section 5 of the river and harbor act approved February 27, 1911.

Under the provisions of this act of Congress 12 original vacancies were immediately created, and 12 additional vacancies were created on February 27, 1912, so that the authorized strength of the Corps of Engineers is now 212 officers. Since the assignment to the Corps of Engineers of the cadets graduating in the fiscal year 1912 there remain 18 vacancies in the grade of second lieutenant, which, under the provisions of the law quoted above, may be filled from civil life.

ENGINEER TROOPS.

The increase in Engineer officers provided for by the act of February 27, 1911, is that considered necessary for properly carrying on the work now devolving upon the Corps of Engineers, and takes no account of a possible increase in the number of Engineer troops. In the annual reports of the Chief of Engineers for 1908, 1909, and 1910 it was pointed out that any further increase in the Engineer troops should be accompanied by a corresponding increase in officers, in order to avoid the necessity for withdrawing from construction work the necessary officers for duty with the additional battalions, which has heretofore so handicapped the civil work of the corps. It is understood that this subject is under consideration by the General Staff, and that this body will recommend in due time an appropriate organization of Engineer troops, with suitable provision for both officers and men and with greater numerical strength than at present, as is considered proper and necessary.

NONCOMMISSIONED OFFICERS OF ENGINEERS.

In the annual reports for 1908, 1909, 1910, and 1911 recommendation was made for the establishment of certain higher grades of noncommissioned officers in the Corps of Engineers, comparable to those in certain other branches of the service, and this recommendation is renewed. The extensive military surveys in this country and in the island possessions, the proper handling of explosives, photography and map reproduction, drafting, the supervision and direction of working parties, both of troops and of civilian labor, the thorough practical knowledge of field works, military bridges, ponton bridges, demolitions, military mining, and road construction, all of which fall within the duties of Engineer troops, demand long and careful training, combined with technical skill in the mechanical trades, and presuppose a high grade of enlisted men. This grade of men is no longer attracted to the Engineer troops. The work of this branch of the service is arduous and pay and opportunities for advancement are no longer such as to attract the best men. Engineer troops are expected and required to perform all the usual post duties, to be well trained in infantry maneuvers and in rifle practice, to understand the handling of horses and mules, and in addition to be thoroughly trained in their own special technical duties. Men about to enlist are guided largely in their choice of a branch of the service by the relative opportunities of advancement offered in the several branches, as well as by the relation between the character of the work and the compensation received.

It is at present quite generally true that many of the most efficient engineer soldiers and those who could be developed into men of the highest worth will not reenlist for a second enlistment period. If the engineers are to continue to attract the grade of men needed to properly perform the duties of this branch, they must offer opportunities of advancement at least equal to those of the other technical branches of the service, such as the Coast Artillery and the Signal Corps. Under present conditions, not only do the better and more intelligent class of men hesitate to enlist in the engineers, but the engineers are subject to a steady drain of their best men through refusal to reënlist on discharge, through discharge by purchase, and through transfer to other branches of the service where easier service is rewarded by almost equal pay. It is believed that if the efficiency of the engineer troops is to be kept up to the high standard demanded and expected of them these conditions must be remedied by increasing the opportunities of promotion for good men and by the creation of additional higher grades as a reward for special excellence. As the technical duties of engineer troops require the frequent detachment of small parties, or of individuals, for special duties or for the supervision of working parties, the exact proportion between the number of privates, corporals, and sergeants, based upon the number of squads and sections in the company, is not applicable. Furthermore, the care of the ponton trains, tool wagons, mules, and horses of mounted sections requires wagoners, artificers, saddlers, blacksmiths, and farriers.

The number of cooks allowed to an engineer company should also be increased, as the number now authorized—two for a company of 164 men—is too small for the performance of their duties. Four cooks are regarded as necessary for an engineer company of 164 men, especially in view of the fact that detachments of considerable size are often separated from the company on special service requiring the services of a cook with each detachment, as well as at the headquarters of the company.

The designation of the present grade of "private, second class," should be changed to "private," as the description "second class" is distasteful to the men, and is unnecessary to distinguish this grade from that of "private, first class." This change would also emphasize more clearly the fact that appointment as private, first class, is a promotion in grade, and not merely an increase in pay.

THE BOARD OF ENGINEERS.

The regulations for the government of the Corps of Engineers provide for a board of engineers, consisting of not less than three officers designated by the Chief of Engineers, with the sanction of the Secretary of War. This board acts in an advisory capacity to the Chief of Engineers upon important questions of engineering. One of its principal duties is to plan or revise the projects for permanent fortifications of the United States.

The following changes have taken place in the personnel of the board since the date of the last annual report: Rear Admiral Richard Wainwright, United States Navy, contingent member, retired from active service.

As at present constituted The Board of Engineers is composed of Col. Wm. T. Rossell, Corps of Engineers; Col. W. M. Black, Corps of Engineers; Col. S. W. Roessler, Corps of Engineers; Lieut. Col. E. B. Babbitt, Ordnance Department; Capt. E. M. Adams, Corps of Engineers, recorder and disbursing officer.

In addition, division engineers in whose divisions there are fortifications are members of The Board of Engineers when matters pertaining to defensive works in their respective divisions are under consideration by the board.

During the fiscal year the board has reported upon various subjects connected with fortification work.

FORTIFICATIONS IN THE UNITED STATES.

The scheme of national defense upon which work was in progress between 1888 and 1906 was based primarily upon a report submitted January 16, 1886, by the "Board on Fortifications or Other Defenses," commonly designated the Endicott Board. On January 31, 1905, the President organized a board, with the Secretary of War, Hon. W. H. Taft, as president, to review the projects for the United States and for the insular possessions, to indicate the localities where defenses were most urgently needed, and to determine the character and general extent of the defenses, with their estimated cost. This board is known as the National Coast Defense Board. The board submitted its final report February 1, 1906.

Permanent seacoast defenses have been installed at the following localities in the United States:

1. Kennebec River, Maine.
2. Portland, Me.
3. Portsmouth, N. H.
4. Boston. Mass.
5. New Bedford, Mass.
6. Narragansett Bay, Rhode Island.
7. Eastern entrance to Long Island Sound.
8. New York, N. Y.
9. Delaware River.
10. Baltimore, Md.
11. Washington, D. C.
12. Hampton Roads, Virginia.
13. Cape Fear River, North Carolina.
14. Charleston, S. C.
15. Port Royal, S. C.
16. Savannah, Ga.
17. Key West, Fla.
18. Tampa Bay, Florida.
19. Pensacola, Fla.
20. Mobile, Ala.
21. New Orleans, La.
22. Galveston, Tex.
23. San Diego, Cal.
24. San Francisco, Cal.
25. Columbia River, Oregon and Washington.
26. Puget Sound, Washington.

In accordance with the report of the board above mentioned additional defenses are to be constructed at some of these points and also at the entrance to Chesapeake Bay and at Los Angeles, Cal., when funds have been provided by Congress.

While for present conditions the National Coast Defense Board scheme is, in general, sufficient, the defensive requirements of our seacoast may be subject to change to meet new requirements due to changes in military conditions and in commercial and naval vessels. This scheme carried an estimate amounting to $10,836,400 for emplacement construction (not including electric light or power or land for sites). Appropriations to date, since the submission of the report of the board, aggregate $305,064.

Appropriations for construction of gun and mortar batteries have been made as follows:

Act of—	
Aug. 18, 1890	$1,221,000.00
Feb. 24, 1891	750,000.00
July 23, 1892	500,000.00
Feb. 18, 1893	50,000.00
Aug. 1, 1894	500,000.00
Mar. 2, 1895	500,000.00
June 6, 1896	2,400,000.00
Mar. 3, 1897	3,841,333.00
Allotments from the appropriation for "National defense," act of Mar. 9, 1898	3,827,842.80

Act of—	
May 7, 1898	$3,000,000.00
July 7, 1898	2,562,000.00
Mar. 3, 1899	1,000,000.00
May 25, 1900	2,000,000.00
Mar. 1, 1901	1,615,000.00
June 6, 1902	2,000,000.00
Mar. 3, 1903	2,236,425.00
Apr. 21, 1904	700,000.00
May 27, 1908	300,000.00
Mar. 3, 1909	5,064.00
Total	29,008,664.80

With a view to providing defenses now demanded by existing military, naval, and commercial conditions, an estimate of $100,000 is submitted.

Modernizing older emplacements.—No funds have been provided for this purpose since the fortification appropriation act of March 3, 1909.

Much remains to be done to place the older batteries in satisfactory condition for most efficient operation, including the altering of projectile hoists to meet present requirements, widening loading platforms, platform lighting, etc.

For carrying on the most urgently needed work under this head an estimate of $100,000 is submitted.

Appropriations for modernizing older emplacements have been made as follows:

Act of—	
Mar. 3, 1905	$450,000.00
June 25, 1906	150,000.00
Mar. 2, 1907	100,000.00
May 27, 1908 (new application of funds appropriated for pneumatic-dynamite batteries)	165,261.36
Mar. 3, 1909	100,000.00
Total	965,261.36

Fire control at fortifications.—Such progress has been made during the fiscal year as funds assigned to the Engineer Department have permitted.

The fortification appropriation act approved June 6, 1912, provided the sum of $100,000 for this purpose; these funds are distributed by the Secretary of War among the Engineer and Ordnance Departments and the Signal Corps for expenditure. For the continuation of this work an estimate of $200,000 prepared by the Chief of Coast Artillery is submitted.

Prior to 1905 appropriations for this work were made under the title "Installation of range and position finders" (expended entirely by the Engineer Department), as follows:

Act of—	
July 7, 1898	$150,000
May 25, 1900	150,000
Mar. 1, 1901	150,000
June 6, 1902	325,000
Mar. 3, 1903	223,500
Apr. 21, 1904	225,000
Total	1,223,500

Later appropriations have been made, under the title "Fire Control at Fortifications," applicable to the work of the Engineer and Ordnance Departments and the Signal Corps. The amounts appropriated and the portions thereof assigned to the Engineer Department are as follows:

Act of—	Appropriated.	Assigned to Engineer Department.
Mar. 3, 1905	$1,000,000.00	$590,000.00
June 25, 1906	700,000.00	217,631.87
Mar. 2, 1907	900,000.00	432,784.81
May 27, 1908	270,256.00	129,456.00
Mar. 3, 1909	247,055.00	211,555.00
June 23, 1910	200,000.00	98,690.89
Mar. 4, 1911	100,000.00	
June 6, 1912	100,000.00	
Total	3,517,311.00	1,680,117.57

Electrical installations.—The National Coast Defense Board estimated that $5,216,031 would be required to furnish the necessary electrical equipment for the defenses of the United States in addition to the current required for searchlights.

Funds have been provided by Congress for this purpose as follows:

Act of—	
May 27, 1908	$348,888
Mar. 3, 1909	100,000
Mar. 4, 1911	50,000
Total	498,888

The funds provided in the act of March 4, 1911, were applied to the purchase and installation of a few generating sets where most needed.

For continuing the installation of this equipment at the defenses where they are considered to be most needed an estimate of $50,000 is submitted.

Searchlights.—The procurement and installation of searchlight equipment has been continued during the past fiscal year with the $50,000 appropriated by the act of March 4, 1911. The act of June 6, 1912, has provided $25,000 (by reappropriation) for this purpose, and this amount will all be required for expenditure during the present year.

To carry on the work of installation an estimate of $250,000 is submitted.

Appropriations for searchlights have been made as follows:

Act of—	
Mar. 1, 1901 (New York Harbor)	$150,000
June 6, 1902	150,000
Mar. 3, 1903	150,000
Apr. 21, 1904	150,000
Mar. 3, 1905	200,000
June 25, 1906	125,000
Mar. 2, 1907	210,000
May 27, 1908	210,000
Mar. 3, 1909	210,000
June 23, 1910	50,000
Mar. 4, 1911	50,000
June 6, 1912 (reappropriated from balances of other funds)	25,000
Total	1,680,000

Sites for fortifications.—Beyond negotiations for a few small parcels of ground, required for appurtenances to fortifications, no operations under this appropriation have been possible, due to lack of funds.

With a view to beginning the construction of defenses for the entrance to Chesapeake Bay, an estimate of $150,000 is submitted to be applied to the acquisition of land at Cape Henry.

Appropriations for sites for fortifications have been made as follows:

Act of—		Act of—	
Aug. 18, 1890	$500,000	May 25, 1900	200,000
Feb. 24, 1891	500,000	Mar. 1, 1901	200,000
July 23, 1892	500,000	June 6, 1902	200,000
Feb. 18, 1893	175,000	Mar. 3, 1903	200,000
Aug. 1, 1894	150,000	Apr. 21, 1904	100,000
June 6, 1896	500,000	May 27, 1908	121,048
Mar. 3, 1897	300,000	Mar. 3, 1909	250,000
May 7, 1898	300,000		
Mar. 3, 1899	300,000	Total	4,496,048

Preservation and repair of fortifications.—The modern defenses now existing represent an expenditure of approximately $29,000,000 for battery construction alone. For the preservation and repair of these works and their accessories during the present fiscal year there was appropriated the sum of $300,000, barely more than 1 per cent of the cost of the batteries. These extensive works contain much costly machinery and ordnance material, and must be kept properly painted and repaired to be effective when needed. The $300,000 provided in the act of June 6, 1912, will scarcely be sufficient to keep the essential features of the fortifications in satisfactory condition for the fiscal year. Much desirable and necessary work is now awaiting future appropriations.

An estimate of $300,000 for preservation and repair is submitted, and it is strongly recommended (in the interest of economy and efficient service) that this amount be appropriated.

Appropriations for preservation and repair of fortifications have been made as follows:

Act of—		Act of—	
Sept. 22, 1888	$100,000	June 6, 1902	$300,000
Mar. 2, 1889	100,000	Mar. 3, 1903	300,000
Aug. 18, 1890	80,000	Apr. 21, 1904	300,000
Feb. 24, 1891	80,000	Mar. 3, 1905	300,000
July 23, 1892	60,000	June 25, 1906	200,000
Feb. 18, 1893	45,000	Mar. 2, 1907	200,000
Aug. 1, 1894	45,000	May 27, 1908	225,000
Mar. 2, 1895	45,000	Mar. 3, 1909	225,000
June 6, 1896	50,000	June 23, 1910	300,000
Mar. 3, 1897	100,000	Mar. 4, 1911	300,000
May 7, 1898	100,000	June 6, 1912 ($125,000 reappropriated from balances of other funds)	300,000
Mar. 3, 1899	100,000		
May 25, 1900	100,000		
Mar. 1, 1901	100,000		
Feb. 14, 1902	3,000	Total	4,058,000

Plans for fortifications.—Funds appropriated for this purpose are expended in the preparation or revision of projects and plans of works for the permanent fortification of the United States.

This work is one of the principal duties of The Board of Engineers. Beginning with the act of March 2, 1889, an appropriation of $5,000 for the work has been carried in each fortification appropriation act, and an estimate of this amount is submitted this year.

Supplies for seacoast defenses.—Owing to the large number of electric installations supplying power and light in seacoast batteries, funds have been appropriated annually for tools and supplies for their maintenance and operation. This appropriation is designed to enable the Engineer Department to comply with the regulations of the War Department for the supply and service of the batteries.

The act of June 6, 1912, appropriated $45,000 for this purpose and extended the applicability of the appropriation to include searchlight supplies.

As the earlier electric plants become worn with use, and as additional plants and electrical apparatus are installed from time to time, the demands upon the funds for the purchase of these supplies increase.

The sum of $45,000 is estimated as necessary for the procurement of the regular electrical supplies for the next fiscal year, especially in view of the numerous installations being provided for battery lighting and power and for searchlight service.

Appropriations for supplies for seacoast defenses have been made as follows:

Act of—	
May 25, 1900	$25,000.00
Mar. 1, 1901	25,000.00
June 6, 1902	25,000.00
Mar. 3, 1903	35,000.00
Apr. 21, 1904	35,000.00
Mar. 3, 1905	40,000.00
June 25, 1906	30,000.00
Mar. 2, 1907	40,000.00
May 27, 1908	$44,500.00
Mar. 3, 1909	40,000.00
June 23, 1910	45,000.00
Mar. 4, 1911	45,000.00
June 6, 1912	45,000.00
Total	474,500.00

Reserve lights.—A satisfactory form of reserve electric lantern has been produced as the result of exhaustive tests. To supply these lanterns in sufficient quantities to all batteries in service an estimate of $19,500 was originally submitted. Of this amount the sum of $10,000 was appropriated in the act of March 3, 1909; under this appropriation lights have been purchased and issued to the fortifications so far as the funds available would permit, leaving $9,500 yet to be provided by Congress.

Sea walls and embankments.—The very large number of seacoast reservations renders necessary a considerable expenditure of funds to prevent the washing away of valuable land by the ordinary action of the waves, and to repair damages done by occasional violent storms.

The fortification appropriation act of June 6, 1912, provided $25,000 for this purpose by reappropriation. To provide for maintenance and necessary extensions of existing sea walls and such new sea walls as may be necessary, an estimate of $30,000 is submitted.

Appropriations for sea walls and embankments, exclusive of those for particular localities, have been made as follows:

Act of—	
Sept. 22, 1888	$117,000
June 6, 1896	17,975
Mar. 3, 1897	33,000
May 7, 1898	55,000
Mar. 3, 1899	2,500
May 25, 1900	50,000
Mar. 1, 1901	100,000
June 6, 1902	100,000
Mar. 3, 1903	89,575
Apr. 21, 1904	99,000
Mar. 3, 1905	$19,400
June 25, 1906	50,000
Mar. 2, 1907	25,000
May 27, 1908	50,000
Mar. 3, 1909	50,000
June 6, 1912 (reappropriated from balances of other funds)	25,000
Total	883,450

Repair and protection of defenses of Charleston, Pensacola, Mobile, and New Orleans.—For repairs and sea walls at these localities, rendered necessary by storms, the following estimates were submitted to Congress in 1906:

Charleston, S. C., for the construction of the sea wall necessary for the protection of Fort Moultrie	$225,600
Pensacola, Fla., for building sea walls for the protection of the sites of the fortifications and of the necessary post buildings at Forts Pickens and McRee	907,100
Pensacola, Fla., for repair and restoration of batteries and other structures appurtenant to the defenses of Pensacola, and for retaining walls to protect the batteries from floods	109,355
Mobile, Ala., for repair and restoration of batteries and other structures appurtenant to the defenses of Mobile, and for rebuilding sea walls and groins for protection of the sites of the fortifications of the garrison posts	1,089,500
New Orleans, La., for rebuilding and strengthening the levees for protection of the site of the defenses and the garrison post at Fort St. Philip	139,800

In 1907, 1908, and 1909 appropriations were made covering the estimates for Charleston, Mobile, and Pensacola. The work at Charleston has been completed. The work at Pensacola and Mobile is progressing satisfactorily toward completion.

In 1907 the sum of $100,000 was appropriated for the levees at Fort St. Philip. This amount was insufficient to protect the entire reservation and a portion thereof was abandoned to overflow, the most important portion being inclosed by levees. For the adequate protection against high water of this portion of the reservation, however, it is necessary that a portion of the levee be raised and strengthened, and for this purpose it is estimated that $16,000 will be required. An estimate of this amount is submitted.

Appropriations for this work have been made as follows:

Act of Mar. 2, 1907:	
Sea wall, Fort Moultrie, S. C	$100,000
Repair and protection of defenses of New Orleans, La	100,000
Repair and protection of defenses of Pensacola, Fla. (for sea wall)	400,000
Repair and protection of defenses of Pensacola, Fla. (for batteries, etc.)	50,000
Repair and protection of defenses of Mobile, Ala	500,000
Act of May 27, 1908:	
Sea wall, Fort Moultrie, S. C	125,600
Repair and protection of defenses of Pensacola, Fla. (for batteries, etc.)	59,355
Repair and protection of defenses of Mobile, Ala	589,500
Act of Mar. 3, 1909, repair and protection of defenses of Pensacola, Fla. (for sea walls)	507,100

Under the provisions of the fortification appropriation act of June 6, 1912, balances of these appropriations have been applied to other objects of expenditure, as follows:

Sea wall, Fort Moultrie, S. C	$8,992
Repair and protection of defenses of Pensacola, Fla.:	
For batteries, etc	1,008
For sea walls	40,000
Repair and protection of defenses of Mobile, Ala	96,000
	146,000

Sea walls, defenses of Galveston, Tex.—The defensive works at Galveston are unavoidably in most exposed positions, and the level of the lands surrounding the batteries was greatly lowered by the storm of September 8, 1900. Work of reconstruction and repair of the Galveston defenses is now completed under the appropriation of $992,000 contained in the fortification act approved March 1, 1901. With the funds so provided, and in accordance with the plans before Congress when that appropriation was made, each individual battery has been made secure against any similar storms which are likely to occur in the future.

For building a sea wall and filling up the reservation at Fort Crockett to a height above storm tides the sums of $591,046.25 and $158,953.75 were appropriated in the sundry civil appropriation acts of April 28, 1904, and June 30, 1906, aggregating $750,000. The retaining wall in the rear of the reservation has been undermined by washouts, permitting portions of the fill to escape. With a view to remedying this condition, it is contemplated to provide for an extension upon private land of the fill at the adopted grade of 2 per cent until it intersects the natural surface of the ground (the consent of the owners being first obtained); the estimated cost of this work is $88,000.

For a sea wall and fill at Fort Travis the sum of $440,000 was provided in the fortification appropriation act approved March 3, 1909. The work under this appropriation is in active progress and approaching completion. Under the provisions of the fortification appropriation act of June 6, 1912, a balance of $65,000 pertaining to this appropriation has been applied to other objects of expenditure.

Similar protection is required at Fort San Jacinto if this fort is to be garrisoned. There are, however, certain claims to portions of this reservation adverse to the title of the United States. Until all clouds upon the title of the United States are removed no money should be expended on this reservation.

Repair and protection of the defenses of Key West, Fla.—On October 14, and again on October 17, 1910, severe hurricanes were experienced at Key West, Fla., the wind velocities reaching 60 and 105 miles per hour, respectively. The storms occasioned considerable damage to the defensive works at Key West, demolishing a number of fire-control structures, storehouses, etc., washing away the sand cover of certain batteries, and entirely destroying the approach to the wharf being constructed for the torpedo service and for landing vessels with supplies, etc., for the general use of the garrison. The repairs of these damages were provided for so far as practicable from funds appropriated for general maintenance work, but certain items of work, including principally the restoration of the wharf, required a special appropriation. The fortification appropriation act of June 6, 1912, provided $36,000 for this purpose, and the work of restoration is now in progress.

Preservation and repair of torpedo structures.—A large number of new torpedo-defense structures have been completed and a number, in addition, are approaching completion.

Situated as they are at exposed locations on the Atlantic, Gulf, and Pacific coasts, the requirements for the maintenance of these structures are considerable. The act of June 6, 1912, provided $20,000 for this purpose, and extended the applicability of the appropriation to include the maintenance of channels for access to torpedo wharves.

This sum is being applied to such minor repairs and maintenance as are found from time to time to be most urgently necessary. In view of the very large number of these structures and the necessity for frequent repairing and minor repairs to prevent marked deterioration in the buildings, the sum of $20,000 has not been sufficient during the past year for all necessary work, and an estimate of $30,000 is submitted this year.

Appropriations for preservation and repair of torpedo structures have been made as follows:

Act of—	
June 25, 1906	$10,000
Mar. 2, 1907	10,000
May 27, 1908	15,000
Mar. 3, 1909	20,000
June 23, 1910	$20,000
Mar. 4, 1911	20,000
June 6, 1912	20,000
Total	115,000

Submarine mines.—Prior to the act of June 6, 1902, all work in connection with the submarine-mine defense was under the Engineer Department. This act assigned to the Artillery the purchase of torpedo material proper, leaving to the Engineer Department the erection of casemates, galleries, storehouses, and other necessary structures.

The fortification appropriation act approved March 4, 1911, provided $50,000 for this purpose, and work under this appropriation is now approaching completion. To provide additional structures which are necessary under existing projects, an estimate of $35,000 is submitted.

Appropriations for work under the Engineer Department have been made since July 1, 1888, as follows:

Date of act.	Appropriated.	Covered into surplus fund or repaid to national-defense fund.	Net appropriation.
Sept. 22, 1888: Materials, structures, experiments, instruction, and movable torpedoes	$200,000.00		$200,000.00
Mar. 2, 1889:			
Mines and appliances	250,000.00		250,000.00
Structures	250,000.00		250,000.00
Experiments and instruction	30,000.00		30,000.00
Movable torpedoes	50,000.00	$24,775.00	25,225.00
Shed San Francisco	22,000.00	216.77	21,783.23
Aug. 18, 1890:			
Mines and appliances	100,000.00		100,000.00
Structures	100,000.00		100,000.00
Experiments and instruction	30,000.00	100.00	29,900.00
Feb. 24, 1891:			
Mines and appliances	50,000.00		50,000.00
Structures	50,000.00		50,000.00
Structures, Goat Island, Cal	16,000.00	4,616.68	11,383.32
Mar. 2, 1895:			
Mines and appliances	20,000.00		20,000.00
Structures	20,000.00		20,000.00
June 6, 1896: Materials and structures	100,000.00		100,000.00
Mar. 3, 1897: Materials and structures	150,000.00		150,000.00
Mar. 9, 1898 (national defense); presidential allotments:			
Mar. 17, 1898—Materials, including searchlights	250,000.00		250,000.00
Mar. 31, 1898—Portion of allotment for torpedo service	8,725.00		8,725.00
Apr. 2, 1898—Torpedo operations	1,150,000.00	120,323.70	1,029,676.30
Apr. 21, 1898—Planting torpedoes	150,000.00	48,290.45	101,709.55
Jan. 21, 1899—Torpedo defense (actually expended from consolidated allotment)	456.71		456.71
May 4, 1898:			
Material	50,000.00	1,194.39	48,805.61
Planting mines	300,000.00	68,097.84	231,902.16
May 7, 1898: Materials and structures	150,000.00		150,000.00

Date of act.	Appropriated.	Covered into surplus fund or repaid to national-defense fund.	Net appropriation.
July 7, 1898:			
Maintenance of mine fields	$736,000.00	$736,000.00	
Additional material, operating searchlights and electric plants	650,000.00	192,616.49	$457,383.51
Mar. 3, 1899: Material and structures	50,000.00		50,000.00
May 25, 1900: Material and structures	50,000.00		50,000.00
Mar. 1, 1901: Material and structures	50,000.00		50,000 00
Feb. 14, 1902: Deficiency	2.68		2.68
June 6, 1902: Structures	33,000.00		33,000.00
July 1, 1902: Deficiency	4.38		4.38
Mar. 3, 1903: Structures	50,000.00		50,000.00
Apr. 21, 1904: Structures	87,000.00		87,000.00
Mar. 3, 1905: Structures	400,000.00		400,000.00
June 26, 1906: Structures	175,000.00		175,000.00
Mar. 2, 1907: Structures	175,000.00		175,000.00
May 27, 1908: Structures	175,000.00		175,000.00
Mar. 3, 1909: Structures	100,000.00		100,000.00
Mar. 4, 1911: Structures	50,000.00		50,000.00
	6,278,188.77	1,196,231.32	5,081,957.45

Miscellaneous appropriations.—In addition to the appropriations hereinbefore reported, the following special appropriations have been made since July 1, 1888, for work in connection with seacoast fortifications in the United States under the Engineer Department:

Sept. 22, 1888 (army appropriation act): Repairs to wharf and sea wall at Willets Point	$2,500
Aug. 18, 1890:	
Preservation and repair of Fort Marion, Fla., and sea wall	15,000
Sea wall, Governors Island, New York Harbor	50,000
Feb. 24, 1901:	
Protection of shore at Fort Monroe, Va	27,000
Artesian well at Fort Monroe ($5,908.95 returned to surplus fund)	6,000
Aug. 1, 1894:	
Sea wall, north shore at Sandy Hook, N. J	7,500
Sewerage system at Fort Monroe, Va. ($10,472.69 returned to surplus fund)	37,500
Mar. 3, 1897: Riprap wall, eastern beach at Sandy Hook, N. J	75,000
July 7, 1898: Pneumatic dynamite gun batteries ($22,857.18 reappropriated for "Modernizing older emplacements")	150,000
May 25, 1900:	
Sea wall and fill, Fort Caswell, N. C	150,000
Pneumatic dynamite gun batteries ($142,404.18 reappropriated for "Modernizing older emplacements")	180,000
June 6, 1902: Riprap stone wall, eastern beach at Sandy Hook, N. J	75,000
Mar. 3, 1905: Sea wall, north beach, at Sandy Hook, N. J	40,000

The following money statements show the condition on June 30, 1912, of all general appropriations under which operations were in progress in the United States at the close of the fiscal year:

"GUN AND MORTAR BATTERIES."

For battery construction.

July 1, 1911, balance unallotted	$7,494.57
June 30, 1912, net amounts returned from allotments during fiscal year	4,480.23
July 1, 1912, balance unallotted and available	11,974.80

For modernizing older emplacements.

July 1, 1911, balance unallotted	$7,507.29
June 30, 1912, net amounts returned from allotments during fiscal year	741.10
July 1, 1912, balance unallotted	8,248.39
July 1, 1912, amount pledged	8,248.39

"FIRE CONTROL AT FORTIFICATIONS."

July 1, 1911, balance unallotted	$1,804.34
June 30, 1912, net assignments to the Chief of Engineers during fiscal year	55,380.39
	57,184.73
June 30, 1912, net allotments during fiscal year	55,817.64
July 1, 1912, balance unallotted	1,367.09
July 1, 1912, amount pledged	1,180.00
July 1, 1912, amount available for miscellaneous work	187.00

"ELECTRICAL INSTALLATIONS AT SEACOAST FORTIFICATIONS."

July 1, 1911, balance unallotted	$49,500.85
June 30, 1912, net allotments during fiscal year	47,106.80
July 1, 1912, balance unallotted	2,394.05
July 1, 1912, amount pledged	2,394.05

"SEARCHLIGHTS FOR HARBOR DEFENSES."

July 1, 1911, balance unallotted	$64,944.28
June 6, 1912, appropriated	25,000.00
	89,944.28
June 30, 1912, net allotments during fiscal year	60,413.81
July 1, 1912, balance unallotted	29,530.47
July 1, 1912, amount pledged	29,530.47

"SITES FOR FORTIFICATIONS AND SEACOAST DEFENSES."

July 1, 1911, balance unallotted	$76,895.75
June 30, 1912, net allotments during fiscal year	210.23
July 1, 1912, balance unallotted and available	76,685.52

"PRESERVATION AND REPAIR OF FORTIFICATIONS."

July 1, 1911, balance unallotted	$63,198.92
June 6, 1912, appropriated	300,000.00
	363,198.92
June 30, 1912, net allotments during fiscal year	51,371.36
July 1, 1912, balance unallotted	311,827.56
July 1, 1912, amount pledged	311,827.56

"PLANS FOR FORTIFICATIONS."

June 6, 1912, appropriated	$5,000.00
July 1, 1912, balance unallotted and pledged	5,000.00

"SUPPLIES FOR SEACOAST DEFENSES."

July 1, 1911, balance unallotted	$17,346.54
June 6, 1912, appropriated	45,000.00
	62,346.54
June 30, 1912, net allotments during fiscal year	15,709.09
July 1, 1912, balance unallotted	46,637.45
July 1, 1912, amount pledged	31,579.60
July 1, 1912, amount available	15,057.85

"SEA WALLS AND EMBANKMENTS."

July 1, 1911, balance unallotted	$7,026.51
June 6, 1912, appropriated	25,000.00
July 1, 1912, balance unallotted	32,026.51
July 1, 1912, amount pledged	25,325.00
July 1, 1912, balance available for emergencies	6,701.51

"PRESERVATION AND REPAIR OF TORPEDO STRUCTURES."

July 1, 1911, balance unallotted	$3,358.19
June 6, 1912, appropriated	20,000.00
	23,358.19
June 30, 1912, net allotments during fiscal year	3,358.19
July 1, 1912, balance unallotted	20,000.00
July 1, 1912, amount pledged	20,000.00

"CASEMATES, GALLERIES, ETC., FOR SUBMARINE MINES."

July 1, 1911, balance unallotted	$38,563.40
June 30, 1912, net allotments during fiscal year	32,586.64
July 1, 1912, balance unallotted	5,976.76
July 1, 1912, amount pledged	5,976.76

Estimates of appropriations required for 1913–14 for fortifications in the United States.

Gun and mortar batteries—	
Construction of gun and mortar batteries	$100,000
Modernizing older emplacements	100,000
Electrical installations at seacoast fortifications	50,000
Searchlights for harbor defenses	250,000
Sites for fortifications and seacoast defenses	150,000
Preservation and repair of fortifications	300,000
Plans for fortifications	5,000
Supplies for seacoast defenses	45,000
Sea walls and embankments	30,000
Repair and protection of defenses of New Orleans, La	16,000
Preservation and repair of torpedo structures	30,000
Casemates, galleries, etc., for submarine mines	35,000
	1,111,000

FORTIFICATIONS IN INSULAR POSSESSIONS.

Batteries.—The first appropriation for this purpose was contained in the fortification act approved April 21, 1904, and additional appropriations have been made in each of the succeeding years, the aggregate amount appropriated to date being $8,140,200 (including

$250,000, the expenditure of which was assigned to the Chief of Ordnance). With these appropriations batteries have been constructed at Guantanamo Bay, Cuba, and construction work is now in progress at Honolulu and Pearl Harbor, Hawaii, and Manila and Subic Bays, Philippine Islands.

Estimates for this work, amounting to $70,000 for the Hawaiian Islands and $1,000,000 for the Philippine Islands, are submitted, to permit the continuation of work at these localities.

Appropriations for this work have been made as follows:

Act of—	Generally applicable.	Hawaiian Islands.	Philippine Islands.
Apr. 21, 1904	$700,000		
Mar. 3, 1905	700,000		
June 25, 1906		$260,000	
Mar. 2, 1907		200,000	$500,000
May 27, 1908		400,000	954,000
Mar. 3, 1909		337,200	[1] 1,000,000
June 23, 1910			800,000
Mar. 4, 1911		150,000	1,169,000
June 6, 1912		170,000	800,000
Total	1,400,000	1,517,200	[1] 5,223,000

[1] Including $250,000, the expenditure of which was assigned to the Chief of Ordnance.

Electrical installations.—The National Coast Defense Board estimated that $788,713 would be required to furnish the necessary electrical equipment for the defenses of the insular possessions, in addition to the current required for searchlights.

Toward the installation of this equipment the sum of $455,254 has thus far been provided by Congress, $34,469 for the Hawaiian Islands, and $420,785 for the Philippine Islands. With the funds available, electrical equipment is now being procured and installed. For the continuation of this work an estimate is submitted of $34,469 for the Hawaiian Islands; this sum is the unappropriated balance of the total National Coast Defense Board estimate. So far as can be determined in the present status of the work on the defenses, the amount estimated for the Hawaiian Islands will be sufficient.

Appropriations for this work have been made as follows:

Act of—	Hawaiian Islands.	Philippine Islands.
May 27, 1908	$20,000	$115,000
Mar. 3, 1909	14,469	88,823
June 23, 1910		45,000
Mar. 4, 1911		171,962
Total	34,469	420,785

Searchlights.—The funds heretofore appropriated for this purpose have been applied to the completion of the adopted projects so far as their amounts permitted. To complete the installation of the searchlights covered by existing projects in the Hawaiian Islands and the Philippine Islands, estimates of $10,800 and $20,600, respectively, are submitted. So far as data are at present available, the amounts of these estimates will be sufficient for the purpose for which submitted.

Appropriations for this work have been made as follows:

Act of—	Generally applicable.	Hawaiian Islands.	Philippine Islands.
Mar. 2, 1907	$30,000		
May 27, 1908		$47,500	$180,000
Mar. 3, 1909		66,000	
June 23, 1910			139,000
Mar. 4, 1911		40,100	
Total	30,000	153,600	319,000

Procurement of sites.—For the procurement of land or rights pertaining thereto in the Philippine Islands the sum of $5,000 was provided by the fortification act of May 27, 1908, and the additional sum of $12,000 by the act of March 3, 1909. The acquisition by condemnation of the land required has been completed.

The acquisition of additional land in the Hawaiian Islands with the unexpended balance of the funds provided therefor in the fortification appropriation act of June 25, 1906, is in progress.

Appropriations for this work have been as follows:

Act of—	Hawaiian Islands.	Philippine Islands.
Apr. 21, 1904	$200,000	
June 25, 1906	150,000	
May 27, 1908		$5,000
Mar. 3, 1909		12,000
Total	350,000	17,000

Preservation and repair of fortifications.—A number of the batteries authorized by Congress for the insular possessions have been completed and are being operated by the troops. Repairs, painting, etc., are from time to time necessary. The approaching completion of work at certain localities and the exhaustion of construction funds render provision for such work necessary in the future. Estimates are accordingly submitted of $1,500 and $14,000 for this purpose for the defensive works in the Hawaiian Islands and the Philippine Islands, respectively. The $8,000 appropriated for this purpose in the Philippine Islands and the $500 in the Hawaiian Islands, by the act of June 6, 1912, will be applied, so far as the funds are available, to the most necessary work required during the fiscal year.

Appropriations for this work have been made as follows:

Act of—	Hawaiian Islands.	Philippine Islands.
June 23, 1910		$7,000
Mar. 4, 1911		7,000
June 6, 1912	$500	8,000
Total	500	22,000

Preservation and repair of torpedo-defense structures.—In order to provide for the maintenance in proper condition of the numerous structures already erected in connection with torpedo defense, estimates of $500 and $1,000, respectively, have been submitted for the Hawaiian Islands and the Philippine Islands. The $500 provided for this purpose in the act of June 6, 1912, will be applied, so far as it is sufficient for the purpose, to the care of the existing structures in the Philippine Islands. This act extended the applicability of this appropriation to include the maintenance of channels for access to torpedo wharves.

Appropriations for this work have been made as follows:

Act of—	
June 23, 1910 (Philippine Islands)	$1,000
Mar. 4, 1911 (Philippine Islands)	1,000
June 6, 1912 (Philippine Islands)	500

Supplies for seacoast defenses.—Under appropriations heretofore made by Congress a number of electric plants have been installed in the defensive works in the Hawaiian and Philippine Islands, and in order that the necessary supplies and materials may be furnished for their operation and maintenance, as for similar plants in this country, estimates of $1,000 and $5,000, respectively, have been submitted. For work of this character in the Hawaiian and Philippine Islands $750 and $2,500, respectively, were provided by the act of June 6, 1912, with which the supplies most urgently required will be procured. This act also extended the applicability of this appropriation to include searchlight supplies.

Appropriations for this work have been made as follows:

Act of—	Hawaiian Islands.	Philippine Islands.
June 23, 1910		$2,500
Mar. 4, 1911	$1,000	2,500
June 6, 1912	750	2,500
Total	1,750	7,500

Submarine mines.—Work in the insular possessions for which funds are available is rapidly approaching completion. For the construction of additional defenses of this character required in the Philippine Islands an estimate of $67,000 is submitted.

Appropriations for this work have been made, as follows:

Act of—	Generally applicable.	Philippine Islands.	Hawaiian Islands.
June 8, 1898 (for Manila Harbor)		$150,000	
Mar. 2, 1907	$200,000		
May 27, 1908			$129,000

Land defenses.—For the construction of works of defense against landing parties in the Philippine Islands the sum of $180,000 was appropriated by the fortification appropriation act approved March 4, 1911. Work under this appropriation is in active progress and will shortly be completed.

Fire control.—No funds for this purpose were provided by the fortification act of June 6, 1912, and no estimate for additional funds is submitted this year.

Appropriations for this work have been made as follows:

Act of—	Appropriated.	Assigned to Engineer Department.
Mar. 2, 1907	$100,000	$75,000
May 27, 1908	243,000	75,000
Mar. 3, 1909	250,000	222,427
June 23, 1910	200,000	13,150
	793,000	385,577

The following money statements show the conditions on June 30, 1912, of all general appropriations under which operations were in progress in the insular possessions at the close of the fiscal year:

"FORTIFICATIONS IN INSULAR POSSESSIONS."

For construction of seacoast batteries.

July 1, 1911, balance unallotted	$1,234,290.12
June 6, 1912, appropriated	970,000.00
	2,204,290.12
June 30, 1912, net allotments during fiscal year	816,179.30
July 1, 1912, balance unallotted	1,388,110.82
July 1, 1912, amount pledged	1,388,110.82

For electrical installations.

July 1, 1911, balance unallotted	249,695.16
June 30, 1912, net allotments during fiscal year	53,974.58
July 1, 1912, balance unallotted	195,720.58
July 1, 1912, amount pledged	195,720.58

For searchlights.

July 1, 1911, balance unallotted	151,392.07
June 30, 1912, net allotments during fiscal year	27,037.98
July 1, 1912, balance unallotted	124,354.09
July 1, 1912, amount pledged	124,354.09

For torpedo structures.

July 1, 1911, balance unallotted	2,185.95
June 30, 1912, net allotments during fiscal year	478.50
July 1, 1912, balance unallotted	1,707.45
July 1, 1912, amount pledged	1,707.45

For sites, Philippine Islands.

July 1, 1911, balance unallotted	2,950.00
July 1, 1912, balance available	2,950.00

For electrical and other supplies.

July 1, 1911, balance unallotted	1,886.00
June 6, 1912, appropriated	3,250.00
	5,136.00
June 30, 1912, net allotments during fiscal year	1,204.95

July 1, 1912, balance unallotted	$3,931.05
July 1, 1912, amount pledged	1,456.05
July 1, 1912, amount available	2,475.00

For maintenance of fortifications.

July 1, 1911, balance unallotted	9,877.00
June 6, 1912, appropriated	8,500.00
	18,377.00
June 30, 1912, net allotments during fiscal year	8,510.50
July 1, 1912, balance unallotted	9,866.50
July 1, 1912, amount pledged	8,000.00
July 1, 1912, amount available	1,866.50

For maintenance of torpedo structures.

July 1, 1911, balance unallotted	1,483.00
June 6, 1912, appropriated	500.00
	1,983.00
June 30, 1912, net allotments during fiscal year	814.00
July 1, 1912, balance unallotted	1,169.00
July 1, 1912, amount pledged	1,000.00
July 1, 1912, amount available	169.00

For land defenses, Philippine Islands.

July 1, 1911, balance unallotted		159,194.00
June 30, 1912, net allotments during fiscal year	$90,253.07	
May 23, 1912, assigned to Signal Corps for disbursement	12,500.00	
		102,753.07
July 1, 1912, balance unallotted		56,440.93
July 1, 1912, amount pledged		26,666.92
July 1, 1912, amount available		29,774.01

"FIRE CONTROL IN INSULAR POSSESSIONS."

July 1, 1911, balance unallotted	2,371.19
June 30, 1912, net amounts returned from allotments during fiscal year	6,356.55
July 1, 1912, balance unallotted	8,727.74
July 1, 1912, amount pledged	1,152.00
July 1, 1912, balance available	7,575.74

Estimates of appropriations required for 1913–14 for fortifications in the insular possessions.

Fortifications in insular possessions:	
For seacoast batteries—	
Hawaiian Islands	$70,000.00
Philippine Islands	1,000,000.00
For electrical installations, Hawaiian Islands	34,469.00
For searchlights—	
Hawaiian Islands	10,800.00
Philippine Islands	20,600.00

Fortifications in insular possessions—Continued.	
For maintenance of fortifications—	
Hawaiian Islands	$1,500.00
Philippine Islands	14,000.00
For maintenance of torpedo structures—	
Hawaiian Islands	500.00
Philippine Islands	1,000.00
For electrical and other supplies—	
Hawaiian Islands	1,000.00
Philippine Islands	5,000.00
For casemates, galleries, etc., for submarine mines in the Philippine Islands	67,000.00
Total	1,225,869.00

FORTIFICATIONS, ISTHMIAN CANAL.

The construction of these works is under the Isthmian Canal Commission, but plans for the various defensive works are being prepared by the Chief of Engineers, and substantial progress in their preparation has been made.

MILITARY STRUCTURES, PHILIPPINE ISLANDS.

The construction of a pumping plant, electric power plant, and certain army storehouses for military purposes in the Philippine Islands has been assigned to the Engineer Department and funds from various appropriations applied thereto. These funds are insufficient for the completion of the work. It is now estimated that the additional sum of $170,000 will be required for this purpose, and an estimate of this amount is submitted.

ENGINEER DEPOTS.

WASHINGTON BARRACKS.

This depot is the repository for part of the military bridge equipage of the army; for miscellaneous military engineering tools, apparatus, supplies, and materials of all kinds; and for astronomical, surveying, drafting, and reconnoissance instruments and supplies used by the army and by officers of the Corps of Engineers on public works, both military and civil. It purchases and issues military engineering tools and supplies and serves particularly as an exchange for engineer instruments of all kinds, receiving them from the army or public works, caring for them while in store, making the necessary repairs, reissuing them when required, and, so far as appropriations will permit, making purchases of such items as can not be supplied from store.

Numerous shipments have been made during the year. A large number of instruments have been repaired in the instrument repair shop. All new instruments were examined and tested there.

A new building for depot shops and trade schools is urgently needed, the estimated cost being $22,000. This work is included in the estimates for buildings for the engineer post and school at Washington Barracks.

Ponton shed No. 2, 36 feet by 162 feet and two stories in height, with elevator and overhead trolley system for second floor, was built and completed during the year at a cost of $14,784. An additional shed is, however, needed to properly care for the ponton equipment on hand and under contract, and an estimate of $15,000 therefor is included in the estimate for "Engineer Equipment of Troops" for the fiscal year ending June 30, 1914.

FORT LEAVENWORTH.

This depot is the repository for part of the military bridge equipage of the army, as well as tool, stores, and miscellaneous supplies. The general work of the office and storehouse comprised the care of property on hand, the purchase of supplies, the repair of instruments, issues to the battalion of Engineers there stationed, and the keeping of the depot accounts and records.

Work in the shops during the year has included the fabrication and repair of all articles of the ponton equipage except chess and ponton carriages. This work was interrupted in March, 1911, by the departure of the Engineer battalion for duty with the maneuver division in Texas, but was resumed in October, 1911, upon the return of the troops.

Among the needs of this depot are the installation of electric lights in the storehouse and the construction of an additional ponton shed.

VANCOUVER BARRACKS.

This depot is the repository for part of the military bridge equipage of the army, as well as tools, stores, and miscellaneous supplies. Work during the year has included the fabrication and repair of ponton equipage excepting the fabrication of wagons therefor, the purchase and issue of materials, tools and supplies to Engineer troops, and some minor repairs to instruments.

HONOLULU.

This depot assembles and issues property and materials for the military operations in the Hawaiian Islands, cares for property in store, makes such minor repairs to instruments as can be made locally, and obtains and issues such engineer supplies as are required by the engineer troops stationed at Honolulu. Operations during the year have been confined to these activities.

MANILA.

This depot is the repository of two divisions of the advance guard ponton equipage, and for miscellaneous tools, property, and supplies required for issue and for reserve equipment in the Philippines Division. The depot also makes minor repairs to instruments used in the military surveys in the Philippines Division.

The personnel at the depot was, on June 30, 1912, made up as follows:

Civilians: One storekeeper, American; 1 machinist, native; 2 carpenters, native; 5 laborers, native.

Enlisted (all from Third Battalion of Engineers): One battalion quartermaster sergeant, 1 corporal, and 12 privates.

These men perform all necessary office work; make and handle shipments; prevent as far as possible destruction due to rust, dry rot, white ants, and dampness, and make repairs.

The battalion quartermaster sergeant was detailed on work at the depot on February 20, 1912; two American clerks were discharged during the last quarter. Otherwise the numbers on the above list are about the average of those employed and detailed during the year. Prior to the arrival of the Third Battalion of Engineers the enlisted detail was from Company H, Second Battalion of Engineers.

ENGINEER DEPOTS, 1912.

Incidentals.

Amount appropriated in the army appropriation act of Mar. 3, 1911	$20,000.00
June 30, 1912, amount expended during fiscal year	15,820.94
July 1, 1912, balance unexpended	4,179.06
July 1, 1912, outstanding liabilities	4,165.53
Balance to revert to Treasury	13.53

Instruments.

Amount appropriated in the army appropriation act of Mar. 3, 1911	$10,000.00
Collection on account of damages to instruments	40.21
Total available	10,040.21
June 30, 1912, amount expended during fiscal year	9,375.58
July 1, 1912, balance unexpended	664.63
Outstanding liabilities	614.63
Balance to revert to Treasury	50.00

ESTIMATES OF APPROPRIATIONS REQUIRED FOR THE ENGINEER DEPOTS FOR 1913–14.

For incidentals	$20,000.00
For instruments	10,000.00
Total	30,000.00

ENGINEER EQUIPMENT OF TROOPS.

With funds appropriated under this head engineering supplies were obtained for the various military divisions and departments in the United States and insular possessions, and for engineer troops.

At Washington Barracks issues of new instruments and repairs to old under the provisions of existing orders have been numerous during the year. Issues under General Orders, No. 221, War Department, 1907, have been suspended until further notice, under instructions from the War Department, and issues under General Orders, No. 73, War Department, 1907, are now authorized only so far as possible from supplies in hand. The question as to what reconnaissance and other engineer equipment is to be supplied to the army at large is now under consideration by the War Department, and pending decision thereon it has not been possible to accumulate any considerable reserve supply of such items.

Although the equipment of engineer companies is also undergoing revision, a considerable quantity of reserve supplies of items not likely to be changed has been purchased.

A number of requisitions, amounting in all to approximately $10,000, were received and filled for the Organized Militia, reimbursement for which is made by Treasury settlement.

The purchase and fabrication of ponton equipage has been continued during the year, and a new ponton shed was constructed at Washington Barracks with funds provided by the appropriation.

ENGINEER EQUIPMENT OF TROOPS, 1912.

Engineer equipment.

Amount appropriated in the army appropriation act of Mar. 3, 1911	$75,000.00
Collections on account of lost property	530.25
Sales of serviceable property	29.50
Total available	75,559.75
June 30, 1912, amount expended during fiscal year	46,217.21
July 1, 1912, balance unexpended	29,342.54
July 1, 1912, outstanding liabilities	28,537.75
Balance to revert to Treasury	804.79

Ponton shed.

Amount appropriated in the army appropriation act of Mar. 3, 1911	$15,000.00
June 30, 1912, amount expended during fiscal year	14,798.68
July 1, 1912, balance unexpended	201.32
July 1, 1912, outstanding liabilities	187.01
Balance to revert to Treasury	14.31

ESTIMATE OF APPROPRIATIONS REQUIRED FOR THE ENGINEER EQUIPMENT OF TROOPS FOR 1913–14.

For ponton material, tools, instruments, equipment, and supplies required for use in the engineer equipment of troops, including the purchase and preparation of engineer manuals	$50,000.00
For construction of ponton shed at Washington Barracks, D. C., for shelter of new ponton and bridge material	15,000.00
Total	65,000.00

EQUIPMENT OF OFFICERS' SCHOOLS, MILITARY POSTS.

For the purchase of instruments for issue to officers' schools at military posts the sum of $3,000 was assigned from the appropriation for "Equipment of Officers' Schools, Military Posts, 1912," by the Secretary of War. This amount has been applied to the purchase of instruments for issue from the engineer depot at Washington Barracks. For similar purchases during the current fiscal year the sum of $1,500 has been assigned to the Engineer Department.

July 13, 1911, assigned to Engineer Department, act of Mar. 3, 1911	$3,000.00
June 30, 1912, amount expended during fiscal year	2,422.51
July 1, 1912, balance unexpended	577.49
July 1, 1912, outstanding liabilities	577.49

CIVILIAN ASSISTANTS TO ENGINEER OFFICERS.

By act of Congress approved March 3, 1911, the sum of $42,000 was appropriated for civilian assistants to engineer officers serving on the staffs of division, corps, and department commanders to enable them to secure the services of surveyors, survey parties, draftsmen, photographers, master laborers, and clerks during the fiscal year 1912. These funds have been applied to the purpose for which appropriated.

The army appropriation act approved August 24, 1912, contained an item of $40,000 for this purpose for the fiscal year 1913. The reorganization of the military establishment into territorial divisions has, by permitting a consolidation of offices, resulted in a moderate reduction in the number of civilian assistants required by the chief engineer officers, and it is anticipated that the funds appropriated for the current year will be sufficient for its requirements. An estimate of $40,000 for the fiscal year 1914 is submitted.

Amount appropriated by army appropriation act approved Mar. 3, 1911	$42,000.00
June 30, 1912, amount expended during fiscal year	38,540.03
July 1, 1912, balance unexpended	3,459.97
July 1, 1912, outstanding liabilities	864.33
Balance to revert to Treasury	2,595.64

CONTINGENCIES, ENGINEER DEPARTMENT, PHILIPPINE ISLANDS.

In the prosecution of work of great importance in the Philippine Islands in remote and almost inaccessible localities the operations of the Engineer Department require funds of wide applicability and limited restrictions as to expenditure. Owing to the circumstances under which the work must be performed an appropriation of this character has been found essential to its satisfactory prosecution. Appropriations of $5,000 each for this purpose have been made for the fiscal years 1911, 1912, and 1913, and an estimate of the same amount is submitted for the fiscal year 1914.

Amount appropriated by army appropriation act approved Mar. 3, 1911	$5,000.00
June 30, 1912, amount expended during fiscal year	3,109.14
July 1, 1912, balance unexpended	1,890.86
July 1, 1912, outstanding liabilities	1,877.49
Balance to revert to Treasury	13.37

MAPS, WAR DEPARTMENT.

With the $5,000 appropriated for this purpose for the fiscal year ending June 30, 1912, a number of miscellaneous military maps were printed.

These funds are also utilized in the publication of accurate maps of our fortified harbors, which, under existing regulations, are required for the use of the Coast Artillery, and a number of these maps were printed during the year. A portion of the appropriation has also been applied to the procurement of lithographic equipment needed for the publication of these harbor charts.

In view of the urgent necessity of printing certain important military maps now being prepared in addition to the prosecution of the work ordinarily accomplished under this appropriation, the estimate submitted for the fiscal year ending June 30, 1913, was increased to $10,000. Only $5,000 was, however, provided for this purpose. To permit the prompt publication of these maps, in addition to the work ordinarily accomplished under this appropriation, an estimate of $10,000 is submitted.

Amount appropriated by sundry civil act approved Mar. 4, 1911	$5,000.00
Collections on account of lost property	3.40
Total available	5,003.40
June 30, 1912, amount expended during fiscal year	4,746.03
June 30, 1912, balance unexpended	257.37
June 30, 1912, outstanding liabilities	253.97
Balance to revert to Treasury	3.40

BUILDINGS, ENGINEER POST AND SCHOOL, WASHINGTON BARRACKS, D. C.

The creation of the engineer post and school at Washington Barracks was authorized by an act of Congress approved June 30, 1902, and the work has been carried on in accordance with a general layout approved by the Secretary of War December 22, 1904, drawing of which was published in Annual Report of the Chief of Engineers for 1906.

A detailed history of the work is given in the Annual Reports of the Chief of Engineers from 1902 to 1906.

The buildings heretofore completed have been for post purposes almost exclusively, and the present plan provides for additional buildings for school and post purposes, as follows:

1. Group of buildings to include engineer school and administration buildings and power house and trade-school building:		
Engineer school and administration building	$275,000	
Power house	27,500	
Trade-school building	22,000	
		$324,500
2. Completion of west barracks		40,000
3. Bachelor officers' quarters		70,000
4. Six double sets noncommissioned officers' quarters		66,000
5. Dispensary and quarters for detachment		25,000
6. Stable		20,000
7. Store sheds for wood, coal, and lumber		2,000
8. Chaplain's quarters		20,000
9. Commissary officers' quarters		15,000
10. Observatory		3,000
11. Roads, walks, sidewalks, sewers, water and gas supply, electric distribution, gutters, etc		25,000
		610,500

The river and harbor appropriation act approved July 25, 1912, provided $100,000 for the construction at the engineer school of a building with library accommodations and other facilities for the instruction of officers of the Corps of Engineers in duties pertaining to the improvement of rivers and harbors. This sum will be applied to the construction of so much of item 1 above as is properly applicable to the work of the school exclusively and as the funds provided will permit.

This appropriation reduces the amount yet required under item 1 to $224,500, and reduces the total amount required to $510,500.

The work of the engineer school is also of the greatest importance in fitting the younger officers of the corps for the important military duties which, owing to the present shortage of officers, devolve upon them at an early period in their careers. The $100,000 provided by the act of July 25, 1912, while covering so much of the total cost as belongs to river and harbor work, will not be sufficient to cover the portion of item 1 required for school purposes, including military features, and it is desirable that additional funds be provided as early as practicable for completing this group of buildings, to provide urgently needed accommodations for the administration officers of the post and engineer depot, as well as for the military functions of the school.

Amount appropriated by act of—	
June 30, 1902	$500,000
Mar. 2, 1903	360,000
Mar. 2, 1905	150,000
Mar. 2, 1907	32,500
July 25, 1912	100,000
Total	1,142,500
July 25, 1912, amount expended to date	1,042,500
July 25, 1912, balance available	100,000

In addition $1,700 was appropriated in the army appropriation act of March 3, 1909, for the completion of a stable. This work was done by the Quartermaster's Department.

The following are the items for which at present funds are most urgently needed for the service of the post, depot, and school, arranged in the order of relative urgency:

1. Completion of West Barracks			$40,000
2. Six double-sets noncommissioned officers' quarters			66,000
3. Bachelor officers' quarters			70,000
4. Group of buildings to include engineer school and administration buildings, and power house and trade school building:			
Engineer school and administration building	$275,000		
Power house	27,500		
Trade school building	22,000		
		$324,500	
Less amount appropriated July 25, 1912		100,000	
			$224,500

Under instructions from the Secretary of War, however, an estimate of only $40,000 is submitted this year to cover the completion of the West Barracks (Barracks No. 2).

It is understood that the estimate of the Chief, Quartermaster Corps, includes provision for the dispensary.

EQUIPMENT OF COAST ARTILLERY, ARMORIES, ORGANIZED MILITIA.

The army appropriation act approved March 3, 1911, provided the sum of $338,170 for the equipment of armory buildings provided by States for instructional purposes for Coast Artillery companies of the Organized Militia. With these funds equipments are being installed for the instruction of Coast Artillery militia at the following places:

Boston, Mass., South Armory.
Bridgeport, Conn.
New York City:
    Ninth District Armory.
    Thirteenth District Armory.
Savannah, Ga.
San Francisco, Cal.

For the work required of the Engineer Department in this connection the sum of $105,426.56 has been assigned to this department for expenditure by the Secretary of War. At the close of the fiscal year the engineer work at the Boston Armory had been completed so far as possible pending the arrival of the armament and other equipment, and the work remaining to be done at this armory and the necessary work at the other armories had been placed under contract.

By the army appropriation act of August 24, 1912, the availability of this appropriation was extended to include obligations incurred during the fiscal year ending June 30, 1913.

Assigned to Engineer Department		$105,426.56
June 30, 1912, amount expended during fiscal year		8,906.63
July 1, 1912, balance unexpended		96,519.93
July 1, 1912, outstanding liabilities	15,637.30	
July 1, 1912, covered by existing contracts	75,559.37	
		91,196.67
July 1, 1912, balance available		5,323.26

RIVER AND HARBOR IMPROVEMENTS.

Appropriations.—The funds with which the works for the improvement of rivers and harbors were prosecuted during the past fiscal year were derived from the appropriations made by the river and harbor act approved February 27, 1911, and the sundry civil act approved March 4, 1911, from such appropriations as have been provided by other general acts and by special acts of Congress, and from the available balances of former appropriations.

The following works are provided for by permanent appropriations: Removing sunken vessels; operating and care of dredge boats on upper Mississippi River; removing obstructions in Mississippi River; gauging waters of the Mississippi River and its tributaries; examinations and surveys at South Pass, Mississippi River; maintenance of South Pass Channel, Mississippi River; operating snag boats on Ohio River; operating and care of canals, etc.; support and maintenance of the Permanent International Commission of the Congresses of Navigation.

Total appropriations for rivers and harbors to June 30, 1911	[1] $693,914,237.68
Amount appropriated by river and harbor act approved July 25, 1912	31,059,370.50
Amount appropriated by sundry civil act approved Aug. 24, 1912	9,500,250.00

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[1] Including permanent annual appropriations and related works.

Amount appropriated by deficiency act approved Aug. 26, 1912:		
Claims for damages by collisions, river and harbor works		$1,509.05
Claims allowed by Auditor of the War Department		181.88
Permanent annual appropriations (including $3,000 for the Permanent International Commission of the Congresses of Navigation		297,600.00
Apr. 3, 1912, Mississippi River, on account of floods		350,000.00
Apr. 16, 1912, Mississippi River, on account of floods		300,000.00
Apr. 30, 1912, Mississippi River, on account of floods		(1)
May 9, 1912, Missouri River, bank protection		50,000.00
Total		735,478,149.11
Expended under indefinite appropriations, fiscal year 1912:		
Operating and care of canals, etc	$2,222,709.71	
Removing sunken vessels, etc	64,848.74	
		2,287,558.45

RELATED WORKS.

Expenses of California Débris Commission (sundry civil act of Aug. 24, 1912)	$15,000.00	
Prevention of deposits, New York Harbor (sundry civil act of Aug. 24, 1912)	85,260.00	
International Waterways Commission (sundry civil act of Aug. 24, 1912)	10,000.00	
		110,260.00
		737,870,967.56

NOTE.—The river and harbor act of March 3, 1909, appropriated the sum of $9,435,750, which included the sum of $50,000 for the National Waterways Commission, which latter item was first credited to the War Department and later transferred to the Treasury Department.

Status of works.—Statements derived from the reports of the officers in charge of the various works, and given herewith, set forth the condition of each improvement and the extent of the work performed during the past fiscal year.

Expenditures.—The total amount actually expended under the direction of the Chief of Engineers in connection with the improvement of rivers and harbors during the fiscal year ending June 30, 1912, is as follows:

Rivers and harbors (general, including examinations, surveys, and contingencies)	$29,499,598.88
Removing sunken vessels	64,848.74
Operating and care of canals	2,222,709.71
Operating snag and dredge boats on upper Mississippi, Illinois, and Minnesota Rivers	23,442.40
Removing obstructions in Mississippi, Atchafalaya, and Old Rivers	97,978.58
Gauging waters of the Mississippi River and its tributaries	8,727.23
Maintenance of South Pass Channel, Mississippi River	78,234.60
Examinations and surveys at South Pass, Mississippi River	8,680.00
Operating snag boats on the Ohio River	40,263.83
Prevention of deposits in New York Harbor	101,796.29
California Débris Commission (expenses)	11,553.20
Permanent International Commission of Congresses of Navigation	2,557.57
Meeting of Permanent International Commission of Congresses of Navigation in the United States	13,881.99
International Waterways Commission	19,990.70

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[1] This act appropriated $1,500,000, but provided that this amount should be deducted from the appropriation of $6,000,000 contained in the river and harbor act approved July 25, 1912.

Mississippi River Commission:		
Improving Mississippi River	$2,965,125.91	
Maintaining and protecting levees of the Mississippi River and tributaries against floods	455,094.73	
Rebuilding levees of the Mississippi River and tributaries damaged by floods	29,434.32	
		[1] $3,449,654.96
		35,643,918.68

This amount does not include expenditures for enlargement of Governors Island, New York Harbor, $75,484.94.

Expenditures have also been made, as follows, from funds contributed by States, municipalities, and private parties:

Contributed by State of California for improvement of Sacramento and Feather Rivers, Cal	$2,245.85
Contributed by citizens of Dallas, Tex., for improvement of Trinity River, Tex	9,834.23
Contributed by local interests for improvement of Sabine-Neches Canal, Tex	14,779.32
Contributed by State of Rhode Island for improvement of Pawtucket River, R. I	19,849.93
Contributed by Cape May Real Estate Co. for improvement of Cold Spring Inlet, N. J	2,000.00
Contributed by city of Wilmington, Del., for improvement of Wilmington Harbor, Del	6,541.34
Contributed by city of Augusta, Ga., for improvement of Savannah River, at Augusta	55,183.32
Contributed by citizens of Sioux City, Iowa, for improvement of Missouri River at Sioux City	15,208.20
Contributed by Union Terminal Railway Co. for improvement of Missouri River at St. Joseph, Mo	3,000.00
Contributed by Chicago & Alton Railway Co. for improvement of Missouri River at Glasgow, Mo	4,167.23
	132,809.42
Deduct part of contribution of Sioux City Stock Yards Co. returned, and reported as an expenditure in report for 1911	447.52
	132,361.90

Estimates.—The following estimates are submitted by the Chief of Engineers for the fiscal year ending June 30, 1914:

Under continuing contracts	$12,937,982
Rivers and harbors (general, including Mississippi River Commission, and examinations, surveys, and contingencies)	43,829,010
Under California Débris Commission (expenses)	15,000
Prevention of deposits in New York Harbor	153,200

These estimates are intended to cover only the minimum requirements for the prosecution and maintenance of the various improvements, such estimates having been made up from estimates prepared on the same basis by the various district officers; this being done in order to keep within the limited total estimate deemed advisable for the next fiscal year and on the supposition that river and harbor work will be provided for hereafter by annual appropriations.

The total amount recommended for appropriation in the next river and harbor bill (excluding examinations, surveys, and contingencies) is $43,579,010, to be applied to 288 works, and for appropriation in the sundry civil bill $12,937,982, to be applied to 38 works.

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[1] Does not include $8,456.45 expended for "gauging waters of the Mississippi River and its tributaries," included in a separate item above.

Liberal appropriations are considered proper and desirable for snagging and other work necessary to make natural channels available wherever water-borne commerce exists or is reasonably prospective. It is believed that expenditures for such improvements are almost always useful and advantageous to the general public, especially since the introduction and rapid development of small gasoline motor boats for combined freight and passenger transportation. In many cases it is apparent that the failure to use a waterway is due not so much to lack of channel depth as to the presence of snags and other obstructions which can be removed at comparatively small cost, thus making the natural channel depths fully available throughout the year. When the boat commerce develops or its requirements become greater the existing clear channel will be in its best condition for further and more expensive improvements.

Improvements adopted by Congress, and not provided for in the estimates, have been omitted either on account of sufficiency of funds now available, on account of lack of urgency or of relative importance, on account of defective projects which were adopted many years ago and are in need of reexamination with a view to revision or abandonment, or in cases in which recommendations for appropriations for new projects have recently been submitted to Congress in special reports.

In the cases of several improvements recommendations will be found in the text of the report for contract authorizations to cover work to be executed after June 30, 1914. In these cases the additional work, on account of its character and to insure reasonable economy, should be included in contracts or otherwise provided for in connection with the work to be executed during the coming fiscal year.

Under existing law reexaminations of existing projects are made by the Board of Engineers for Rivers and Harbors in compliance with resolutions by either the Committee on Commerce of the Senate or the Committee on Rivers and Harbors of the House of Representatives; but these reexaminations are subject to the limitation that no enlargement of the scope of the project can be considered, so that desirable extensions of projects can not be recommended. It is believed that a similar provision of law authorizing the Chief of Engineers to cause a reexamination of projects, at least those not heretofore passed upon by the Board of Engineers for Rivers and Harbors, would be in the public interest. Projects reported under the provisions of section 7 of the river and harbor act of March 3, 1899, as unworthy of further improvement by the United States or considered by the Chief of Engineers as in need of revision could in this way be fully investigated, local interests could be heard, and formal report thereon made for the consideration of Congress. It would seem advisable in connection with any such reexamination to grant authority to consider and report upon any modifications in the nature of enlargements in scope of projects believed to be desirable, when such modifications are recommended by district officers or otherwise brought to the attention of the department.

If desired by Congress for its consideration in providing for new works, reports could be submitted by the Board of Engineers for Rivers and Harbors and the Chief of Engineers upon the relative importance of the various improvements recommended as worthy of being undertaken by the United States, the order in which the works should be taken up, and the rapidity with which they should be completed, upon methods of standardization by which the waterways of the country could be improved uniformly in proportion to their capacities and to the existing or probable demands of general commerce, or even report upon a systematic scheme of such improvement embracing all waterways, whether heretofore examined and reported upon or not.

Engineer divisions.—The engineering works in charge of this office are arranged in divisions, and officers of the Corps of Engineers were assigned as division engineers to overlook these works, as follows:

East of the Rocky Mountains: Northeast division, Col. W. M. Black; eastern division, Col. William T. Rossell; southeast division, Col. Dan C. Kingman; Gulf division, Lieut. Col. Lansing H. Beach; western division, Lieut. Col. Charles L. Potter; central division, Lieut. Col. H. C. Newcomer; Lakes division, Col. C. McD. Townsend. West of the Rocky Mountains: Pacific division, Col. John Biddle to July 20, 1911, and Lieut. Col. Thomas H. Rees since that date; northern Pacific division, Col. John Biddle to July 20, 1911, and Lieut. Col. Thomas H. Rees since that date, temporarily in charge.

IMPROVEMENT OF RIVERS AND HARBORS IN THE PORTLAND, ME., DISTRICT.

This district was in the charge of Lieut. Col. W. E. Craighill, Corps of Engineers. Division engineer, Col. W. M. Black, Corps of Engineers.

1. St. Croix River, Me.—St. Croix River forms a part of the international boundary between the United States and Canada. Whatever may have been its original or natural condition, the present depth at mean low tide is little more than 3 feet at and near Calais, the head of navigation. The width of the 3-foot channel varies from 180 to 500 feet. Extensive lumbering operations, under wasteful methods carried on for many years, have resulted in large accumulations of sawmill waste, etc., which are in a great measure responsible for the present condition of the stream.

The river has its source in a series of lakes in the State of Maine, on or near the boundary, and flows in a general southeasterly direction for about 100 miles, emptying into Passamaquoddy Bay. The section of the river included in the project for improvement extends downstream from Calais a distance of about 3½ miles. Calais is at the head of navigation and about 14 miles from the mouth of the river. Until the present project no work of improvement has ever been done at this locality by the United States, except the construction of three piers in 1856 and their repair in 1881. The latter work cost $4,000. The river has been examined several times and surveyed, but because of the practice of throwing mill refuse into the stream appropriations made by the United States were diverted, and one by the Canadian Government was not expended. One thousand dollars was expended on survey.

The existing project, adopted by the river and harbor act of June 25, 1910, is to secure a channel 9 feet deep at mean low tide, 100 feet wide from the upper steamboat wharf at Calais to the public landing at St. Stephen, thence 150 feet wide to the lower steamboat wharf at Calais, and thence 12 feet deep and 200 feet wide to Hills Point, in accordance with report printed in House Document No. 748, Sixty-first Congress, second session. From Hills Point downstream there is sufficient width and depth. The estimated cost of this work is $234,000.

This project has not been modified since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
At and below Calais					1867	508
Breakwater [1]	House	27	Forty-sixth	Third		
At and below Calais [2]					1887	477
Do.[2]	House	89	Fifty-first	First	1890	468
Do.[2]	do	55	Fifty-fifth	do	1897	805
Do.[1]	do	748	Sixty-first	Second		

[1] Contains maps. [2] No maps.

The first work under the present project was May 26, 1912, and up to the close of the fiscal year 29,057 cubic yards of material had been taken out. The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, is $3,994.47, all for new work. Sufficient work has not yet been done to afford any material advantage.

The mean tidal range is 19.9 feet.

The traffic by water during the calendar year 1911 was 122,535 short tons, largely lumber and coal, with an estimated total value amounting to $1,670,607. No effect on freight rates or movement is to be expected until the improvement is much further advanced.

The sum estimated for the fiscal year 1914 will be applied to continuation of the dredging. As all the business on the river is done at the head of navigation, the improvement must be practically completed to secure a material measure of benefit.

July 1, 1911, balance unexpended	$74,630.21
June 30, 1912, amount expended during fiscal year, for works of improvement	3,624.68
July 1, 1912, balance unexpended	71,005.53
July 1, 1912, outstanding liabilities	7,184.89
July 1, 1912, balance available	63,820.64
July 1, 1912, amount covered by uncompleted contracts	58,129.12
Amount (estimated) required to be appropriated for completion of existing project	[1] 159,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 159,000.00

(See Appendix A 1.)

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[1] Exclusive of the balance unexpended July 1, 1912.

2. Lubec Channel, Me.—This channel lies between the eastern extremity of the State of Maine and Campobello Island, Canada.

Originally the depth was about 5 feet at mean low tide and 2 feet at low water of spring tides. At and near low tide vessels were unable to navigate the passage and were obliged to take a route about 10 miles longer, through Canadian waters, to reach Lubec, Eastport, Calais, Pembroke, and other ports in Maine on the St. Croix and Pembroke Rivers. The channel is about 3 miles long.

A project was adopted in 1879 which, as subsequently modified, provided for a channel 275 feet wide, increasing to 300 feet in the bends, and 12 feet deep at mean low tide. This project was completed in 1890, practically as proposed, at a cost of $168,954.68.

The present project was adopted August 18, 1894, and its object was to widen the then existing channel to a least width of 500 feet, at an estimated cost of $150,000.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entire channel [1]	Senate	29	Forty-fifth	Third	1879	279
Do.[1]					1884	460
Do.[1]	House	158	Fifty-first	Second	1891	616
Do.[1]					1904	778

[1] Contains maps.

The existing project has not been modified. There were no operations during the past fiscal year, and no expenditures. The balance of funds remaining ($11,567.02) was carried to the surplus fund of the Treasury June 30, 1912.

The project has been completed at a cost of $138,478.30, all for work of improvement.

The maximum draft that can be carried is about 11.5 feet at mean low water; the mean variation in tide level is 18.2 feet. The channel, which is about 3 miles long, connects the roads above with the Atlantic Ocean, and is the convenient and direct approach to Lubec, Eastport, and St. Croix River from the westward. It is an international passage, and the benefits from the improvement are almost entirely general. As the tidal currents are very strong and dense fogs frequent, the widening of the passage decreases the chances of stranding and collision.

It is impracticable to make a definite statement covering the navigation using the channel, but the tonnage for the calendar year 1911 for the town of Lubec, at the head of the passage, is given as 60,945 short tons, having an estimated value of $2,500,000, the chief items being canned goods (principally sardines), fish, and coal. The chief effect on freight rates probably arises through the competition afforded by a direct line of steamers to Portland and Boston, the railroads giving the public lower rates to points having water lines of transportation.

No further annual reports will be submitted.

July 1, 1911, balance unexpended	$11,567.02
June 30, 1912, carried to surplus fund of the Treasury	11,567.02

(See Appendix A 2.)

3. *Breakwater from Mount Desert to Porcupine Island, Bar Harbor, Me.*—The object of the breakwater is to protect the wharves of Bar Harbor and the anchorage in front of the town from the heavy seas of southerly gales.

The act of August 11, 1888, made an appropriation for commencing the work. The project was modified in 1893 as to length of breakwater, and now provides for a structure of riprap stone, extending from Porcupine Island 2,500 feet in a westerly direction to a point about 600 feet from the low-water line on Mount Desert Island. The top of the breakwater is to be at the level of mean high tide, 20 feet wide, and the side slopes such as the rock assumes—about 1 on 1. The estimate of cost was based on the expectation that 382,000 tons of stone would be required, and was placed at $420,200.

For report on examination and survey, with map, see Annual Report of the Chief of Engineers for 1887, page 481; see also map at page 576, report for 1891; and page 678, report for 1893, for modification of project.

Operations during the fiscal year just ended consisted in placing 3,591 tons of stone in the breakwater, under a contract which was nearly completed at the close of the previous year. The expenditures to June 30, 1912, amounted to $251,817.09, all for construction, including claim of Thomas Rys Smith, $6,391.12, provided for by act of Congress approved June 23, 1894.

This project was placed under the continuing-contract system by the act of February 27, 1911—yet to be appropriated $70,200. A contract covering the completion of the breakwater has been made under this authority.

The breakwater has been built for a distance of about 1,960 feet, leaving about 540 feet yet to be constructed; the total quantity of stone deposited to the present time is 236,693 tons, or about 62 per cent of the estimated whole.

The beneficial effects resulting from the portion of the breakwater already built in protecting the wharves at Bar Harbor and the anchorage basin, which is extensively used by costly pleasure craft during the summer season, are appreciably felt, but in order to secure the desired protection at high water of spring tides it may be found necessary to raise the breakwater to a height of about 6 feet above mean high tide. The mean range in tides is 10.5 feet.

The benefits to navigation are general in providing a harbor of refuge, and local in making it possible for boats to land at the wharves at all times with safety. The only convenient method of transportation to and from Bar Harbor is by boat.

The tonnage of Bar Harbor for the calendar year 1911 is reported as 65,950 short tons. The value of commodities constituting the freight traffic is estimated at $1,157,970; it is impracticable to estimate the value of vessel property afforded protection.

The new appropriation asked for is to be applied in extending the breakwater in accordance with the project.

July 1, 1911, balance unexpended	$39,901.32
June 30. 1912, amount expended during fiscal year, for works of improvement	10,327.29
July 1, 1912, balance unexpended	29,574.03
July 1, 1912, outstanding liabilities	295.84
July 1, 1912, balance available	29,278.19
Amount appropriated by sundry civil act approved August 24, 1912	75,000.00
Amount available for fiscal year ending June 30, 1913	104,278.19
July 1, 1912, amount covered by uncompleted contracts	120,125.00
Amount of continuing contract authorization, act of Feb. 27, 1911	145,200.00
Amount appropriated under such authorization	75,000.00
Amount yet to be appropriated	70,200.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 70,200.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 70,200.00

(See Appendix A 3.)

4. Harbor at Sullivan Falls, Me.—Sullivan River, which is about 9 miles north of Bar Harbor, has a length of about 6 miles and is the outlet of a large bay. About midway of its length a point of land projects to such extent as to reduce the width to about one-fourth that immediately above and below, and at this place the slope and velocity are such that the locality is termed "Sullivan Falls." The bottom is ledge, the higher portions forming dangerous obstructions to navigation. Hatchers rock, about midway of the narrow channel at the falls, had originally only about 6 inches of water over it at mean low tide.

Under a project set forth in report of the district engineer, dated December 10, 1870 (see Annual Report of the Chief of Engineers for 1871, p. 836), and under appropriations based thereon, the sum of $35,000 was expended in removing three old piers, in excavating the obstructing ledges at the falls to a depth of 7 feet at mean low tide, and in replacing spindles on two rocks near the mouth of the river. This work was completed in 1875 and was of material benefit to navigation.

The present project is that referred to in the river and harbor act of June 3, 1896, as the "approved project," and published in the Annual Report of the Chief of Engineers for 1891, page 619 (H. Doc. No. 84, 51st Cong., 2d sess., with map). It provides for removing Hatchers rock and two other points of ledge to a depth of 10 feet at mean low tide, at an estimated cost of $35,000. This project has not been modified.

The expenditures under the existing project to June 30, 1912, are $14,870.64, all for new work. There were no operations during the fiscal year 1912 and no expenditures.

The work done under the existing project has consisted in removing the entire area of Hatchers rock and about five-sixths of ledge "C" to the depth of 10 feet at mean low tide. About 70 per cent of the work covered by the project has been accomplished. To complete the project, about 255 cubic yards of ledge measured in place are yet to be removed.

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[1] Exclusive of amount available for fiscal year 1913.

The improvement not only increases the navigable depth, but also, by removing the cause of eddies and cross currents, has added to the length of time at each high and low tide during which vessels may pass through the rapids with safety.

Vessels can not use the channel at low stages except when the tide is slack. This occurs after the tide has flowed about 2 feet, at which time vessels drawing 11 feet can pass through safely.

The improvement may be regarded as permanent.

The mean range in tides is 10.5 feet.

The commerce for the calendar year 1911 is given as 74,150 short tons, nearly all granite, with an estimated value amounting to $160,000. The improvement is reported as affecting freight rates, but definite figures in this respect are not available. The tonnage is increasing.

No estimate for additional funds is submitted. With the appropriation carried in the river and harbor act approved July 25, 1912, it is hoped that sufficient work can be done so that the project may be regarded as practically completed.

Amount appropriated by river and harbor act approved July 25, 1912	$5,000
Amount available for fiscal year ending June 30, 1913	5,000
Amount (estimated) required to be appropriated for completion of existing project	[1] 15,000

(See Appendix A 4.)

5. Union River, Me.—Union River connects a series of lakes and ponds in the eastern part of the State, flows about 50 miles in a southerly direction, and discharges into Blue Hill Bay, about 20 miles east of Penobscot Bay.

The navigable portion of the river extends from the head of Union Bay to the foot of the falls at Ellsworth, a distance of about 3¼ miles. The improvement covers both extremities and some intermediate sections. The dam at Ellsworth has no lock, and navigation is stopped at that point. There is some logging on the river above, but it is no longer extensive.

Before improvement the channel was obstructed by a large deposit of slabs, edgings, and sawdust near Ellsworth, which practically suspended navigation, except at high tide, by projecting ledges in the Narrows, about three-fourths of a mile below the wharves at Ellsworth, by bowlders at several points along the channel, and by a broad, flat bar of sawdust and mud at the mouth.

The first project for the improvement of the river is contained in the report of the district officer dated June 30, 1867, and provided for erecting beacons, removing sunken ledges and bowlders, and dredging mill waste near Ellsworth, so as to secure a depth of 3 feet at mean low tide, this being the available depth on the bar at the mouth of the river. This improvement was completed in 1873 with an expenditure of $30,000.

A survey was made in 1889 under the provisions of the act of 1888, and a new project was submitted with a view to obtaining a depth of 6 feet at mean low tide from the wharves at Ellsworth to deep water in the bay. This depth was to be obtained by dredging mill waste near Ellsworth, by removal of ledge in the Narrows, and by dredging across the bar at the mouth of the river. To maintain the improved depth at the latter point, the same project provided for the construction of a training wall to concentrate the ebb flow in the channel. The project is described on page 462, Part I, Annual Report of the Chief of Engineers for 1890, and was estimated to cost $225,000.

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[1] Exclusive of amount available for fiscal year 1913.

The act of June 3, 1896, appropriated $15,000 for improving the river, by dredging, and as $145.000 represented the estimated cost of the dredging operations under the project submitted in 1890, that sum was adopted as the estimated cost, and the project was taken to cover the dredging only. Serious movements of the mill waste in the river obliterated some of the work; some modifications were afterwards made; and in 1902, when the funds were practically exhausted, the results secured were a channel depth of 6 feet at mean low tide up as far as the vininity of Ellsworth and a channel 4 feet deep at mean low tide at the latter locality. Expenditures under this project have been $143,891.85.

In 1908 an examination indicated that there had been some shoaling at the mouth of the river, and to a greater degree near Ellsworth. In the other portion of the river the work had practically maintained. The erection of a new large dam at the head of navigation rendering it unlikely that any more material would come down from the deposits above, in April, 1909, an allotment of $15,950 was made from the appropriation for preservation and maintenance of river and harbor works provided by the river and harbor act of March 3, 1909, for the purpose of restoring the conditions of 1902. The expenditures under the latter allotment to June 30, 1912, have been $14,095.15, all for maintenance. The contract for restoration of the channel depths previously made was completed in August, 1910, giving 6 feet at mean low tide at the mouth of the river and above the Narrows, and 4 feet at Ellsworth. After the work was done a few bowlders, which obstructed the channel, were taken out by hired labor. The latter was regarded as new work and the expenses were paid from funds which had been appropriated for improvement of the river. All work projected had then been accomplished except the removal of a few bowlders and ledges above the project limits, for which existing balances were made available by an item in the general deficiency appropriation act approved March 4, 1911. This work has now been accomplished.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to Ellsworth					1867	501
Do.[1]	House	138	Fifty-first	First	1890	458
Do.[1]	do	6	Fifty-fifth	do	1897	800
Do.[1]	do	124	do	Second	1898	839
Do.[1]					1899	1026

[1] No maps.

The only work during the fiscal year 1912 has been the removal of a few bowlders and ledges which obstructed the river at Ellsworth.

The total expenditures on the river have been $30,000 under the project of 1867, and $160,950 for subsequent work. Of the latter amount $14,095.15 were for maintenance.

All project work has been accomplished, and funds all exhausted.

The maximum depths are about 6 feet at mean low tide, except at Ellsworth, where the depth is about 4 feet. The mean range in tide is 10 feet.

The commerce for the calendar year 1911 is reported as 11,189 short tons, chiefly lumber and cooperage, coal, and bricks, with an estimated value of $91,281. Water traffic has been declining. It is stated that the improvement has had no effect on freight rates; it is rather a matter of making the small commerce practicable. Ellsworth secures the lower rail rates usually made to water points.

July 1, 1911, balance unexpended	$2,963
June 30, 1912, amount expended during fiscal year, for works of improvement	2,963

(See Appendix A 5.)

6. Bagaduce River, Me.—This is a small stream that empties into Penobscot Bay at Castine, Me. The upper part of the river divides into two branches, one called Northern Bay and the other South Bay. Northern Bay, near South Penobscot, is a shoal sheet of water of about 700 acres area, the bottom of which for the greater part is bare at low tide. Before improvement there was a narrow channel from Bridges Point to Bowden's wharf, which had a depth of less than 2 feet and was obstructed by ledges and bowlders near Winslows Island. The South Bay is obstructed by ledges at Johnsons Narrows.

The river is about 9 miles in length from its mouth at Castine to the head of navigation in Northern Bay. The section which has been under improvement is a channel about 4,000 feet long and lies entirely within Northern Bay.

The approved project is understood to be that published at page 398 of the Annual Report of the Chief of Engineers for 1888 (H. Doc. No. 157, 50th Cong., 1st sess.). Its object is to secure a channel 100 feet wide and 6 feet deep at mean low tide from Bridges Point, Northern Bay, to Bowden's wharf, at an estimated cost of $45,000. The same project provides for removing a small quantity of rock in the channel at Johnsons Narrows, at an estimated cost of $1,875.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Northern Bay and Southern Bay [1]	House	157	Fiftieth	First	1888	398
South Fork [1]	do	17	Fifty-second	Second	1893	724
Northern Bay [2]	do	144	Fifty-fifth	do	1898	842

[1] No maps.

[2] Contains map.

All work has been done in accordance with the above project, which has not been modified.

There were no operations during the fiscal year 1912, and no expenditures.

The expenditures to June 30, 1912, were $28,000. At that date there had been made, by dredging and the removal of rocks and bowlders, a channel 40 feet wide and 6 feet deep at mean low tide, except at Winslows Island, where a depth of only 4 feet has been secured.

The mean tidal range is 9.8 feet.

The tonnage for 1911 is given at 77,159 short tons, but this includes the business at Castine, at the mouth of the river. The commerce for that part of the Bagaduce covered by the project for improvement is put at about 30,000 short tons, the chief items being brick and clay, lumber, and wood.

The improvement has been for some years regarded as of doubtful public value. The commerce is small, and it is questionable as to how much of the limited business would be benefited by the projected channel.

As no appropriation has been made for this work since 1902, further improvement of the locality should be dependent on a reexamination showing such work to be advisable at this time. Pending action by Congress, no further annual reports will be submitted.

Amount (estimated) required to be appropriated for completion of existing project	$18, 875

(See Appendix A 6.)

7. *Penobscot River, Me.*—Penobscot River drains a large number of lakes and small streams, and after assuming distinct character as a stream flows about 100 miles in a southerly direction through the middle of the State, discharging into Penobscot Bay.

Except the dredging of a sawdust bar opposite High Head, near Bucksport, Me., the improvements have been confined to a stretch of about 3½ miles of the river at and below Bangor. Before improvement this part of the river was obstructed by ledge, bowlders, and mill waste to such extent as to afford a safe available depth of only about 6 feet at extreme low tide.

The first project was approved August 22, 1870, and called for a depth of 12 feet at lowest tides for a width of 150 feet over 3½ miles of river at and below Bangor. There was expended $198,300.

In 1884 a project was adopted for widening the channel at Bangor, and for certain improvements in the river below, near Crosbys Narrows. An addition was afterwards made providing for a 22-foot depth between Bucksport and Winterport. After a survey, ordered by the act of September 19, 1890, the project was modified and extended, so that it included a depth of 11 feet at extreme low tide for a width of 360 feet in Bangor Harbor; to widen, straighten, and deepen the channel near Crosbys Narrows and near Stern's mill to a depth of 12 feet at extreme low tide; and to secure a channel depth of 22 feet at mean low tide between Bucksport and Winterport. The estimated cost of the entire work was placed at $440,000. March 3, 1899, the project was again extended by providing for removal of ledge in front of the Boston & Bangor Steamboat Co.'s wharf at Bangor and for deepening the basin of Kenduskeag stream at its junction with the Penobscot, and $28,000 was appropriated for the work. The results aimed at by the project of 1884 and the subsequent additions are regarded as practically accomplished, and the cost has been $172,500, a total expenditure down to this time of $370,800.

By the act of March 2, 1907, Congress adopted a further project for an additional width at Bangor, varying from 100 to 300 feet, for a length of nearly 2,000 feet, the depth to be 11 feet at extreme low tide (14 feet at mean low water). (See H. Doc. No. 739, 59th Cong., 1st sess.) The estimated cost of this work is $130,000.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Above Hampden [1]					1868	863
Oldtown to Medway [1]					1874	831
Bangor [2]	Senate	23	Forty-fifth	Second	1878	198
Bucksport and Bangor [2]					1880	328
Bangor and below [2]	Senate	44	Forty-eighth	First	1884	475
Bangor to Bucksport [1]	House	133	Fiftieth	do	1888	425
Bucksport to Winterport [2]					1889	516
Bangor and below [2]					1892	504
Do.[2]	House	37	Fifty-second	First	1892	533
Marsh River [1]	do	45	Fifty-fifth	do	1897	801
Bangor and below [2]	do	49	do	do	1897	811
Bucksport Narrows [1]	do	61	Fifty-sixth	do	1900	1101
Kenduskeag River [1]	do	54	do	do	1900	1108
Bangor [2]	do	739	Fifty-ninth	do		
Marsh River [1]	do	274	do	Second		

[1] No maps. [2] Contains maps.

The existing project, that of 1907, has not been modified. Except when suspended during winter operations under this project were in progress throughout the fiscal year 1912 under a contract covering the entire work. The amount expended to June 30, 1912, is $77,336.16; all for new work. About 82 per cent of the area has now been completed, about 32 per cent representing the operations for the year. The greater portion of this work is rock excavation.

The least depth over the area now being excavated is about 9 feet at mean low tide, but the prevailing channel depth at Bangor is 14 feet. Elsewhere in the river the depth is greater. While Bangor, where there is a dam without a lock, is the head of steamboat navigation, the river above is extensively used for floating logs down from the upper waters.

The mean range of tide is 13.1 feet. The distance from Bangor to the head of the bay is about 27 miles.

The tonnage for the calendar year 1911 is given as 655,204 short tons, the chief items being coal, lumber, and cooperage. The value of receipts and shipments is estimated as about $11,000,000.

It is said that no reduction in water rates has resulted from the present improvement, which provides for an enlargement of the harbor space, but Bangor secures the usual advantage in rail rates due to its being a water point.

GENERAL IMPROVEMENT.

July 1, 1911, balance unexpended	$8,500.00
June 30, 1912, amount expended during fiscal year, for works of improvement	3,000.00
July 1, 1912, balance unexpended	5,500.00

AT BANGOR.

July 1, 1911, balance unexpended	93,874.53
June 30, 1912, amount expended during fiscal year, for works of improvement	41,210.69
July 1, 1912, balance unexpended	52,663.84
July 1, 1912, outstanding liabilities	19,571.16
July 1, 1912, balance available	33,092.68
July 1, 1912, amount covered by uncompleted contracts	32,795.00

(See Appendix A 7.)

8. *Stockton Harbor, Me.*—Stockton Harbor is a well-protected area of about 1,000 acres on the westerly side of Penobscot Bay, near its head. The greatest depth was on the easterly side, where there was from 18 to 20 feet at mean low tide. This was insufficient for movement of heavy vessels, and a project adopted by the river and harbor act of June 25, 1910, in accordance with plan printed in House Document No. 1166, Sixtieth Congress, second session, provided for dredging a channel on the easterly side 25 feet deep at mean low tide and 300 feet wide, beginning at the 25-foot contour and extending about 3,600 feet into the harbor to a point off the new railroad wharf. The estimated cost was $38,000, the total amount of which was appropriated by the act of 1910.

This is the first project for this locality. The work was completed in accordance with the project during the fiscal year 1911. During the past year an examination made to ascertain conditions indicated that the channel depths secured about a year before had apparently been maintained.

The total expenditures have been $32,019.39, all for new work.

The mean tidal range is 10 feet. The full project depth of 25 feet at mean low tide was secured.

The commerce for the calendar year 1911 amounted to 392,604 short tons, largely coal, paper and rags, fertilizer, and lumber, with an estimated value of $7,719,046.

There is no local business. The tonnage represents the business of a railroad terminal which affords an outlet by water, and the existence of which influences for better the all-rail accommodation affecting a great amount of traffic.

July 1, 1911, balance unexpended	$9,099.80
June 30, 1912, amount expended during fiscal year, for works of improvement	3,119.19
July 1, 1912, balance unexpended	5,980.61

(See Appendix A 8.)

9. *Camden Harbor, Me.*—Camden Harbor is on the westerly side of Penobscot Bay, about 8 miles north of Rockland, Me. It has an area of about 50 acres.

Originally the depth in the outer harbor was about 6 feet at mean low tide, and less than 1 foot in the inner harbor, where most of the wharves are located.

The first project was that of 1872, and under it channels 100 feet wide and 7 feet deep at mean low tide were dredged on both the easterly and westerly sides of the harbor, at a cost of $30,000.

The act of August 11, 1888, made the first appropriation under a project for dredging at the entrance to 12 feet at mean low tide, for dredging the main portion of the harbor to 10 feet at mean low tide, and for small channels in the upper portion to 5 feet. This project was completed in 1897, with an expenditure of $44,940.79.

Under the act of June 13, 1902, a project was adopted for dredging an area in the vicinity of the steamboat wharf, in the outer harbor, to 14 feet at mean low tide. This work was completed in 1903. The cost was $7,459.21.

The total expenditures on Camden Harbor during above period were $82,400.

The existing project, adopted by the river and harbor act of June 25, 1910, is in accordance with plan printed in House Document No. 1117, Sixtieth Congress, second session, and provides for dredging the area in the upper part of the harbor to 10 feet at mean low tide, at an estimated cost of $20,000, which amount was appropriated by the act of 1910.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
(1)					1873	1106
Harbor [1]	House	141	Fiftieth	First	1888	403
Do.[2]	do	263	Fifty-sixth	do	1900	1111
Inner harbor [2]	do	1117	Sixtieth	Second		

[1] No maps.

[2] Contains maps.

The existing project, on which work was in progress at the beginning of the fiscal year, was completed, without modification, in October, 1911. The amount expended on this new work is $19,840.01.

The general depth in the harbor is about 9 feet at mean low tide. The mean tidal range is 9.6 feet.

The tonnage for the calendar year 1911 amounted to 56,408 short tons, principally coal, building materials, etc., having an estimated value of $3,130,325.

The purpose of the new work is to increase the anchorage for small boats. Its effect on freight rates, if any, would be indirect.

July 1, 1911, balance unexpended	$19,484.23
June 30, 1912, amount expended during fiscal year, for works of improvement	19,324.24
July 1, 1912, balance unexpended	159.99

(See Appendix A 9.)

10. Rockport Harbor, Me.—Rockport Harbor is on the westerly side of Penobscot Bay, about 6 miles north of Rockland, Me. It has an area of about 45 acres.

Originally the depth along the wharves in the upper part of the harbor was but 4 feet at mean low tide.

Under a project adopted in 1888 the upper harbor was dredged to 12 feet at mean low tide, at a cost of $15,000.

The existing project was adopted by the river and harbor act of June 25, 1910, and is in accordance with plan printed in House Document No. 963, Sixtieth Congress, first session, which provides for the removal of a ledge, about midway of the entrance to the harbor, over which there is only about 4½ feet at mean low tide. It is proposed to remove the ledge to a depth of 15 feet below the level of mean low tide, at an estimated cost of $32,000, which sum is provided by the act of 1910.

For reports on examinations and surveys see House Document No. 141, Fiftieth Congress, first session (Annual Report of Chief of Engineers for 1888, p. 407), and House Document No. 963, Sixtieth Congress, first session. No maps have been printed. The existing project has not been modified and is now in progress under contract. About 80 per cent of the area has been drilled and blasted and much material removed, but as no regular area has been completed it is impracticable to more definitely state what progress has been made. This work was commenced in September, 1911. The total expenditures under the existing project have been $1,952.91, all for new work.

The mean tidal range is 9.8 feet.

The commerce by water for the calendar year 1911 is reported as 164,800 short tons, the chief items being lumber and cooperage, cement and lime, ice, coal, etc., with an estimated value of $530,595.

July 1, 1911, balance unexpended	$31,594.15
June 30, 1912, amount expended during fiscal year, for works of improvement	1,547.06
July 1, 1912, balance unexpended	30,047.09
July 1, 1912, outstanding liabilities	361.50
July 1, 1912, balance available	29,685.59
July 1, 1912, amount covered by uncompleted contracts	25,228.00

(See Appendix A 10.)

11. Rockland Harbor, Me.—Rockland Harbor is on the westerly side of Penobscot Bay near its mouth. It has an area of about 1,180 acres.

The wharves are located on the shores of three coves, formed by two projecting points of land on the western side of the harbor, known as Crocketts Point and Atlantic Point. The general direction of the wharf frontage is north and south, and the length of frontage is about 800 feet. Before improvement depths in front of the wharves increased very slowly. All the wharves except those at the end of Crocketts Point and Atlantic Point extended only a short distance beyond the low-water contour, a high mean range in tide, which at this point is 9.6 feet, being relied upon to give access to moderate and light-draft vessels at high tides. The entrance to the harbor from the east has a width of about 9,000 feet.

Before improvement the anchorage in front of the wharves, vessels lying at the wharves, and the wharves themselves were endangered by heavy seas during easterly gales.

The first improvement undertaken was to render it a safe harbor of refuge for coastwise shipping, and incidentally also to protect the wharves as far as possible from heavy seas. To accomplish this a project was adopted in 1881 in which two breakwaters were contemplated, one extending south from Jamesons Point, the other a detached breakwater nearer to and opposite the principal wharves in the town, both to be raised in the first instance to the level of mean tide, but with the expectation that a further raising would be necessary as experience might dictate.

In 1886 this project was amended so as to raise the height of the breakwater at Jamesons Point to the level of mean high tide. In 1890 it was again amended so as to eliminate the detached breakwater and to provide for extending farther south than was first contemplated the breakwater at Jamesons Point.

By the act of June 3, 1896, Congress adopted a project for dredging the inner harbor in the vicinity of the wharves to depths ranging from 4 feet to 13 feet at mean low tide and for removing two dangerous ledges, one occupying a central position in the harbor, which was to be cut down to the depth of 22 feet at mean low tide; the other, less centrally located, was to be removed to a depth of 14 feet. The estimated cost was $402,000. By the same act this project was combined with that for the breakwater as one project, and authority was given for completing the whole under the continuing-contract system at an estimated expenditure of $1,036,000. (See H. Doc. No. 85, 54th Cong., 1st sess.)

The existing project is, therefore, the construction of a stone breakwater extending about 4,346 feet in a southerly direction from Jamesons Point, the removal of two groups of ledges, and dredging along the harbor line.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Breakwater [1]					1881	466
Do.[1]					1890	439
Harbor [2]	House	166	Fifty-second	Second	1893	729
Do.[1]	do	85	Fifty-fourth	First	1896	581
Atlantic Point [2]	do	421	Sixty-second	Second		

[1] Contains maps.

[2] No maps.

There was no work, beyond supervision, during the fiscal year 1912, and there were no expenditures.

The appropriations for the above work have aggregated $925,500. Expenditures to the close of fiscal year ending June 30, 1912, have aggregated $920,438.57, of which $4,569.84 has been regarded as for maintenance. As a result the project has been completed, subject to any work that may be needed from time to time until the slopes of the breakwater have assumed a condition of definite permanence. The benefits resulting are that the breakwater affords a safe and extensive anchorage and harbor of refuge. The removal of ledges has increased the available anchorage area, and the dredging affords access to the wharves by vessels of greater draft.

The business by water for the calendar year 1911 amounted to 605,150 short tons, chiefly coal, lumber and cooperage, lime, stone, and general merchandise. The value of the commodities has been estimated as $14,151,750.

It is impracticable to definitely state the direct effect on freight rates. Aside from the advantage arising from competitive water transportation, freight charges by water have been subject to reduction, so far at least as bulk freights are concerned, through economies made possible by the use of larger vessels.

July 1, 1911, balance unexpended	$5,061.43
July 1, 1912, balance unexpended	5,061.43

(See Appendix A 11.)

12. Matinicus Harbor, Me.—Matinicus Harbor has an area of about 20 acres and lies on the easterly side of Matinicus, which is the largest of a group of islands in the Atlantic, off the mouth of Penobscot Bay, and about 20 miles from Rockland Harbor, Me. The harbor is exposed to easterly storms. The project adopted by the river and harbor act of June 25, 1910, is in accordance with plan printed in House Document No. 653, Sixtieth Congress, first session, and is to construct a stone breakwater extending from Youngs Point on Matinicus Island to Indian ledge, a distance of about 450 feet, thereby affording protection for the inner harbor. The estimated cost is $13,000, which amount was appropriated by the act of 1910.

A survey and estimate for work at this locality were made in 1852 at a cost of $1,000; in 1876 another survey was made and printed (no maps) as House Document No. 71, Forty-fourth Congress, first session, and in Annual Report of the Chief of Engineers, for 1876, page 194. A preliminary examination in 1887 is printed in annual report for that year, page 475. The examination and survey on which the existing project is based is printed, with a map, as House Document No. 653, Sixtieth Congress, first session.

The locality being so exposed, the most favorable weather was selected. Construction was commenced July 21, 1911, and was completed September 23, following, in accordance with the project.

The total expenditures have been $13,000, all for new work.

The mean tidal range is 9 feet.

The commerce for the calendar year 1911 amounted to 2,904 short tons, principally fish, coal, and oil. The value of the commodities is estimated at $150,000.

It is reported that the breakwater has given gratifying results in the way of protection.

July 1, 1911, balance unexpended	$12,956.33
June 30, 1912, amount expended during fiscal year, for works of improvement	12,956.33

(See Appendix A 12.)

13. East Boothbay Harbor, Me.—East Boothbay Harbor is an indentation in the west bank of the Damariscotta River, near its mouth.

It is about 3 miles by land eastwardly from Boothbay Harbor, and about 9 miles by water. The mouth of the Damariscotta is about 9 miles east of the mouth of the Kennebec. The harbor is small, having an area of about 7 acres.

Before improvement the depth in front of the wharves was about 5 feet at mean low tide. To accommodate navigation greater depth was needed, and by the river and harbor act of June 25, 1910, a project was adopted for dredging so as to increase the depth to 8 feet at mean low water, in accordance with plans printed in House Documents No. 944, Sixtieth Congress, first session, and No. 684, Sixty-first Congress, second session. The estimated cost was $6,500, and that amount was appropriated by the act of 1910.

The expenditures during the fiscal year 1912 were largely for office expenses, etc.

The total amount expended on the work of existing project, which is the first for this locality, is $6,500, all for new work.

The project has been completed as planned. The mean tidal range is 9.1 feet.

The tonnage for the calendar year 1910 was 7,855 short tons, largely general merchandise, coal, and lumber, with an estimated value of $221,990; statistics for 1911 are not available.

The value of the improvement consists in that it permits a more regular and satisfactory service to a locality dependent upon water transportation.

July 1, 1911, balance unexpended	$1,948.81
June 30, 1912, amount expended during fiscal year, for works of improvement	1,948.81

(See Appendix A 13.)

14. South Bristol Harbor, Me.—South Bristol Harbor is a small indentation on the easterly side of Damariscotta River and about 3 miles above the mouth of that stream. The mouth of the Damariscotta is about 9 miles east of the mouth of the Kennebec. South Bristol Harbor is the westerly end of a passage about 1 mile in length, connecting Damariscotta and Johns Rivers. The value of the passage consists in the fact that it affords a direct protected passage and permits small vessels to avoid a long exposed detour. There is good depth, except at the westerly end, at South Bristol, where a drawbridge spans the narrowest and shoalest part. Directly west of and in close proximity to the bridge a shoulder of ledge projects boldly into the passage and seriously obstructs on otherwise fairway. The least width at low tide is about 10 feet, and the least depth about 2 feet at this place. The draw opening is 30 feet.

The existing project, adopted by the river and harbor act of July 25, 1912, is in accordance with plan printed in House Document No. 564, Sixty-second Congress, second session, and provides for removing the obstructing ledge to the depth of 2 feet at mean low tide, at an estimated cost of $3,500, which amount has been provided by the above-named act.

The mean tidal range is 9.1 feet.

Amount appropriated by river and harbor act approved July 25, 1912	$3 500
Amount available for fiscal year ending June 30, 1913	3,500

(See Appendix A 14.)

15. Boothbay Harbor, Me.—Boothbay Harbor is about 14.5 miles southeast of Bath, Me., by water. The outer harbor is deep and commodious. The inner harbor, which is the locality proposed to be improved, has an area of about 73 acres. The depth at mean low tide is from 14 to 25 feet, except along the wharves and at the upper end, where it is only from 4 to 7 feet. The existing project, adopted by the river and harbor act of July 25, 1912, is in accordance with plan printed in House Document No. 82, Sixty-second Congress, first session, and provides for dredging to a depth of 12 feet at mean low tide along the wharves and at the upper end, at an estimated cost of $18,000, which sum has been provided by the above-named act. This is the first work authorized for this locality.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Inner harbor [1]	House	46	Fifty-fifth	First	1897	802
Do.[2]	do	277	Fifty-sixth	do	1900	1117
Do.[2]	do	82	Sixty-second	do		

[1] No maps. [2] Contain maps.

The mean tidal range is 8.8 feet.

In 1910 the annual commerce of the harbor was reported as amounting to 115,322 short tons, the principal items being ice, coal, sardines, lumber, and miscellaneous freight. The estimated value of the commodities was $3,613,277. The number of passengers was 103,000. The deepening proposed will greatly benefit this traffic by improving access to the wharves.

Amount appropriated by river and harbor act approved July 25, 1912	$18,000
Amount available for fiscal year ending June 30, 1913	18,000

(See Appendix A 15.)

16. Sasanoa River, Me.—The Sasanoa, formerly called Back River, and sometimes "Gut opposite Bath," is a tidal river, or thoroughfare, about 9 miles in length, connecting the Kennebec River, at Bath, Me., with Sheepscot River. Improvement has been confined to a length of about 2 miles at its western end.

Originally this stream was much obstructed in the vicinity of Upper Hell Gate. The channel at and near that place was crooked and narrow and was obstructed by dangerous ledges, the shoalest of which had not more than 3 feet of water over it at mean low tide.

Between 1870 and 1881 the sum of $45,500 was appropriated, and the navigation was much improved by rock excavation, dredging, and the construction of a small jetty.

By act of June 3, 1896, a new project was adopted for widening the channel at Upper Hell Gate to 125 feet, with a depth of 12 feet at mean low tide, by ledge excavation; for dredging to the same depth at Carletons ledges, and for constructing a small jetty at the Camp Ground, at an estimated cost of $19,000, which amount was appropriated by the same act. This project was completed in 1898 at a cost of $11,987.69.

The present project, submitted by the Board of Engineers for Rivers and Harbors February 7, 1907 (Rivers and Harbors Com. Doc. No. 47, 61st Cong., 2d sess.), is to increase to a width of not less than 140 feet the channel 90 feet wide made under the first project through the ledges southeastwardly of Upper Hell Gate, and to remove Flat rock, all to the depth of 12 feet at mean low tide. This project was adopted by the act of March 2, 1907, which contained an appropriation of the entire estimated cost, viz, $44,000.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Western [1]					1867	499
Do.[2]					1890	834
Do.[2]	House	142	Fifty-third	Third	1895	953
Do.[1]	Committee.	47	Sixty-first	Second		

[1] No maps.

[2] Contain maps.

There has been no change in the existing project.

There were no operations during the last fiscal year.

Expenditures under existing project to June 30, 1912, have been $35,000, all for new work, and the project has been completed.

The Sasanoa is a tidal river or thoroughfare, about 9 miles in length, connecting the Kennebec River at Bath, Me., with Sheepscot River. It is the usual route of travel to Boothbay Harbor, a place of considerable importance, and in the summer the travel is much increased by the large number of summer residents at Squirrel Island and other resorts in that vicinity. It is navigable throughout its entire length and has about 12 feet depth at mean low tide over the shoalest parts. The mean range of tide in the vicinity of the last improvement is about 8.5 feet. The work recently completed has resulted in giving practically a straight channel 140 feet wide where the width was formerly 90 feet. By reducing the current it has made the straight channel easily navigable, while before it was regarded as difficult, and vessels used a crooked channel to the westward of Green Island, where there was less current. The increase in discharge capacity and elimination of some of the cross currents has improved the condition in the westerly channel also.

The business for the calendar year 1911 is given as 10,462 short tons of general merchandise, having an estimated value of $1,046,200. The number of passengers carried was 68,500.

The effect on freight rates can not be stated in a definite way, but the improvement permits the use of larger vessels necessary to accommodate the increasing travel and renders the passage less dangerous.

July 1, 1911, balance unexpended	$9,000
July 1, 1912, balance unexpended	9,000

(See Appendix A 16.)

17. Kennebec River, Me.—Kennebec River drains a large number of lakes and minor streams, and from Moosehead Lake, in western central Maine, flows about 150 miles in a southerly direction, and discharges into the Atlantic about 25 miles east of Portland. Works of improvement have been confined to that section of the river between Augusta, at the head of navigation and about 44 miles above the mouth, and the foot of Swan Island, about 20 miles from the mouth.

Before improvement the main channel of the river between the foot of Swan Island and Gardiner was obstructed by shoals near Beef rock, with only 10 feet of water at mean low tide, by dangerous sunken ledges in Lovejoy Narrows, by a shoal below South Gardiner, with only 8 feet on it at mean low tide, and by a ledge at Nehumkeg Island. The steamboat channel to the west of Swan Island (at Hatchs rock) was obstructed by a shoal over which there was only 7½ feet of water, and the channel between Gardiner and Augusta, a distance of 6½ miles, was obstructed by shoals which gave a navigable depth of only 3½ feet in low summer tides.

Appropriations for minor improvements were made at various times between 1827 and 1852.

In 1866 a project was begun for improving the upper part of the river, with a view to obtaining a channel 7 feet deep and 100 feet wide at low water. This project, with modifications, was completed in 1877, and resulted in obtaining a channel 10 feet deep at mean low tide and not less than 100 feet wide as far up as Gardiner, and a depth of 6½ feet at low tide and width of 100 feet from Gardiner to Augusta.

The channel west of Swan Island, being obstructed by shoal water (8½ feet at mean low tide) and a too narrow channel at the head of the island, by shoal water at Hatchs rock, below Richmond, and by a very narrow channel 30 feet wide at the foot of the island, was improved by dredging in 1881–1883, so as to give a channel 175 feet wide and 11 feet deep at the foot of the island and a channel of about 80 feet width and 10 feet depth at Hatchs rock and the head of the island.

The river and harbor act of 1886 provided for a new survey of the river from Bath to Augusta. This survey was made in 1887, and a project embracing dredging, rock excavation, and contraction works was submitted for the further improvement of the river. In 1892 this project was revised to secure depths as follows: Thirteen feet at mean low tide as far up as Sands Island, 12 feet thence to Hinckleys Shoal, above Gardiner, and 10 feet thence to Augusta, at an estimated cost of $388,500. This project was approved August 19, 1892, and was essentially completed in 1898.

The improved channel obtained under the above projects suffered some loss of available depth by the deposits brought down by freshets. This shoaling was most marked in the stretch of 6½ miles of river between Gardiner and Augusta, the further improvement of which was provided for by the river and harbor act approved June 13, 1902, which appropriated $40,000 and authorized a continuing contract for the completion of the project. The last project is published at page 1121 of the Annual Report of the Chief of Engineers for 1900, and proposes a widening of the channel from Gardiner to Augusta to 125 feet and a cleaning out of the old dredged channel and its further deepening to 16 feet at mean high water, or 11 feet at mean low water.

The total estimated cost of the project of 1902, which was $81,000, was appropriated, and the project was completed November 28, 1908.

The total of expenditures under the above projects is $590,411.03.

A project for improvement between the mouth and Gardiner was adopted by the river and harbor act of March 2, 1907, and is designed to obtain, by dredging and ledge excavation, channels through the shoals between the foot of Swan Island and Gardiner at least 150 feet wide and of such depths that for a vessel passing up the river at the usual speed on the flood tide and timed to reach Gardiner at high water the available depth would at no point be less than 20.5 feet. The depth over ledge is to be 1 foot greater than this. Two training walls are to be repaired and one of them lengthened 700 feet. The cost of the project is estimated at $275,000.

The act of 1907 placed the project under the continuing-contract system, and by that and subsequent acts the entire amount has been appropriated.

The existing project is pulished in House Document No. 321, Fifty-ninth Congress, second session.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Augusta to Lovejoy Narrows [1]	House	94	Twenty-fifth	Second		
Gardiner to Augusta					1867	488
Richmond Harbor [2]	House	29	Forty-sixth	Third	1881	479
Augusta to Bath [2]	do	188	Fiftieth	First	1888	412
Swan Island [1]					1890	442
Waterville to Augusta [1]	House	76	Fifty-second	First	1892	541
Gardiner to Augusta [1]	do	262	Fifty-sixth	do	1900	1121
Mouth to Gardiner [1]	do	321	Fifty-ninth	Second		
Popham Beach [2]	do	411	Sixty-first	do		
Swan Island [1]	do	746	Sixty-second	do		

[1] Contain maps.

[2] No maps.

No modification has been made in the existing project, that of 1907.

The only operations during the year consisted in the removal of a small quantity of ledge near South Gardiner.

Expenditures to June 30, 1911, under the existing project have been $269,481.60, all for new work. The project is completed except for a small shoal near Nehumkeg Island, one reported near Abagadasset Point, and one near Weskeag Creek.

The mean rise and fall of tides at Bath is 6.9 feet; at Gardiner, 5.1 feet; at Augusta, 4.3 feet. Augusta is the head of navigation and is about 44 miles above the mouth of the river. Above that point the stream is practically devoted to water power and lumbering operations. Over the shoalest part of the river between the mouth and Gardiner, which is the portion covered by the existing project, about 15 feet can be carried at mean low tide except for the small shoal near Nehumkeg Island, where the depth is about 13 feet. The work under the existing project has extended over a length of river about 14 miles between extremities.

The commerce for the calendar year amounted to 298,256 short tons, the principal items being coal, ice, and pulp.

While the use of the river for transportation purposes has some value in a competitive way, the principal effect on freight rates is due to the increased depths which permit the use of larger vessels and larger cargoes in handling such commodities as coal, ice, and lumber, which demand cheap transportation.

July 1, 1911, balance unexpended	$12,669.24
Receipts from sales	3.25
	12,672.49
June 30, 1912, amount expended during fiscal year, for works of improvement	7,150.84
July 1, 1912, balance unexpended	5,521.65

(See Appendix A 17.)

18. Portland Harbor, Me.—This harbor is located in the southwestern part of the State of Maine. The distance from the lighthouse at the entrance to the upper part of the main harbor is about 6 miles.

The entrance to the main part of the harbor of Portland, or the anchorage, has always been good, but before improvement the approach to the inner harbor was obstructed by a shoal known as the Middle Ground, over which the depth was only from 8 to 10 feet at mean low tide, while between it and Stamford ledge the greatest available depth was only 16 feet. The best part of the wharf front was exposed to swell from the main entrance, which sometimes made it dangerous for vessels to lie at the docks, and along this front the depth was in some places as shallow as 4 feet.

The first work of improvement undertaken by the Government was the construction of the breakwater. This was begun as early as 1836. It was completed in 1874.

The work of deepening the harbor was begun under the act of Congress of 1868, the plan of improvement being to excavate a channel 300 feet wide and 20 feet deep at mean low tide through the southern slope of the Middle Ground and to remove the bar off the Grand Trunk Railroad wharves to the same depth.

The project was modified in 1870 so as to provide for a channel 400 feet wide, and again in 1871 so as to provide for a channel 500 feet wide. In 1872 further modifications were made by including in the project the dredging of Back Cove and the dredging of the inner harbor up to the harbor commissioner's lines to a depth of 16 feet at mean low tide. The project, modified as above described, excepting some dredging in the inner harbor, was completed by 1876. Between 1881 and 1885 the Middle Ground was removed to a depth of 21 feet at mean low tide.

A further deepening of a portion of the harbor to 29 feet at mean low tide was next begun under the project of 1886. To this was subsequently added, in 1890, a small amount of dredging in the upper part of the harbor.

In 1894 the project was extended to cover the widening of the upper part of the 29-foot area and the dredging of a channel 25 feet deep to connect the deep water in the lower part of the harbor with deep water in the upper part. This work was completed in 1894.

By the act of June 3, 1896, Congress adopted a project for dredging to 30 feet at mean low tide over the greater part of the harbor, at an estimated cost of $770,000, and included in the project the further improvement of Back Cove at a combined estimate of $946,250. (See S. Doc. No. 271, 54th Cong., 1st sess.) The same act appropriated $20,000 for beginning work and authorized the making of a contract for its completion.

The latter project was completed in 1902, at a cost which was about $253,000 less than the estimate. By the sundry civil act of March 3, 1905, Congress authorized an amendment to the project by which the 30-foot channel was to be continued up Fore River as far as the Boston & Maine Railroad bridge, a channel of entrance to Back Cove dredged to the same depth, the width in each case to be about 300 feet, and a small area on the south side of the harbor, in front of the old dry dock, also to be dredged. This work was completed in 1908.

Expenditures under the above projects, to June 30, 1912, have been $1,515,643.65. The amount regarded as expended for maintenance of improvement is $2,150.68; the amount received from sales is $9.44. All the above projects have been completed, and appropriations have been made to the extent of the authorization of 1896.

The existing project, adopted by the river and harbor act of July 25, 1912, is in accordance with plan printed in House Document No. 489, Sixty-second Congress, second session (with map). It provides for enlarging the deep-water anchorage opposite the eastern end of the city, for excavating rock and other material so as to give a channel 14 feet deep at mean low tide between Grand Trunk and Tukeys bridges at the entrance to Back Cove, for restoring the channel in Back Cove to 12 feet at mean low tide, for redredging a portion of the channel of approach to Back Cove, and to restore the 30-foot depth over the most important part of the main harbor. The estimated cost is $460,000, with about $2,000 annually for maintenance. The act of July 25, 1912, appropriated $100,000 for commencing work under this project.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Breakwater	House	491	Twenty-third	First		
Do					1866	
Harbor					1868	
Do.[1]					1880	356
Back Cove [1]					1886	541
Harbor [1]					1887	450
Back Cove [1]					1888	888
South side [2]	House	102	Fifty-second	Second	1898	785
Harbor [1]					1901	1008
Witch Rock [2]	House	85	Fifty-sixth	Second	1901	1009
Harbor [2]	do	445	Fifty-ninth	First		
Between Peaks and Great Diamond Islands [2]	do	896	Sixtieth	do		
Harbor [1]	do	489	Sixty-second	Second		

[1] Contains maps.

[2] No maps.

Operations during the fiscal year 1912 included office work, observation, and supervision.

There are no silt-bearing streams emptying into Portland Harbor and the improved depths are expected to be reasonably permanent. The maximum draft that can be carried to the wharves in Portland Harbor at mean low tide is about 29 feet, and at the upper end of Back Cove about 8 feet. The mean tidal range is 8.9 feet.

Two principal advantages have followed this large improvement. A large and well-sheltered deep-water area has been created under the shelter of the breakwater, and the trans-Atlantic vessels can arrive and depart from their docks at the lowest stages of tide.

The portion of the harbor in which most of the dredging has been done is the lower part of so-called Fore River. This river is crossed by four bridges. Going up the harbor these are: (1) Portland Bridge; (2) bridge of the Boston & Maine Railroad, eastern division; (3) Vaughan Bridge, belonging to city; (4) bridge of Boston & Maine Railroad, western division. Portland Bridge has a draw 65 feet wide and admits vessels of the largest class coming to Portland. The next bridge has a draw opening of 60 feet, and the city of Portland has recently reconstructed the third bridge with openings of not less than 60 feet. The improvements in the bridges and the new channel afford great relief to the coal trade and other deep-draft commerce, which was formerly much hampered and retarded by lack of room and sufficient water.

The commerce for the calendar year 1911 is given as 3,162,024 short tons, about one-half of which was coal. The value of the commodities is estimated at $96,751,740. The passenger movement amounted to 1,976,114.

It is impracticable to make a definite statement as to the effect of the improvement on freight rates, but a large trans-Atlantic business has been greatly helped, and the capacity of the harbor has kept pace with the increase in size and draft of vessels used in the coal traffic, with the accompanying saving in cost of transportation.

The new appropriation asked for is to be applied to redredging the main harbor and to extending the deep-water anchorage.

July 1, 1911, balance unexpended	$8,197.22
June 30, 1912, amount expended during fiscal year, for works of improvement	1,104.38
July 1, 1912, balance unexpended	7,092.84
July 1, 1912, outstanding liabilities	33.91
July 1, 1912, balance available	7,058.93
Amount appropriated by river and harbor act approved July 25, 1912	100,000.00
Amount available for fiscal year ending June 30, 1913	107,058.93
Amount (estimated) required to be appropriated for completion of existing project	[1]360,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1]150,000.00

(See Appendix A 18.)

19. Saco River, Me.—Saco River rises in the White Mountain region of New Hampshire and, flowing in a general southeasterly direction, about 105 miles, discharges into the Atlantic about 16 miles southwest of Portland Harbor, Me. The portion of the stream under improvement is that from the towns of Saco and Biddeford, at head of navigation, to the mouth, a distance of about 5 miles.

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[1] Exclusive of amount available for fiscal year 1913.

In its original condition Saco River had a very winding course, with abrupt bends and narrows, which, with its sunken rocks and ledges, presented many difficulties of navigation. The depth on the bar was only 2 feet at mean low water.

The original projects appear to have been—

(1) From 1824 to 1827, for the erection of piers, placing beacons and buoys, and removing obstructions near the entrance to the harbor. Under this project 12 piers of timber and stone were built, 10 in the river to mark sunken rocks and to facilitate navigation by sailing vessels, and 2 outside the mouth designed, but without success, to create a channel through the bar. The construction and maintenance of these works cost, 1824–1827, $12,000.

(2) Adopted by the act of June 23, 1866, to construct a breakwater 2,915 feet long connecting the two outside piers, and to repair the river piers and improve the channel. Under this project, completed in 1874, the channel in the river and through the bar was improved, and a breakwater built on the north side of the channel 4,200 feet long and 10 feet high above mean low water, at an expense of $162,271.75.

The next project was the consolidation by the act of September 19, 1890, of a project adopted in 1884 for repairing the breakwater, extending it 2,200 feet to Sharps ledge, building a stone jetty on the south side of the channel, and dredging between the breakwater and jetty, at an estimated cost of $356,500; and a project adopted in 1886 for improving the river to Saco, 5 miles above the mouth, to the depth of 6 feet at mean low tide, estimated to cost $50,000, amounting in all to $406,500. About 43 per cent of this project has been completed, practically all except the extension of the breakwater to Sharps ledge.

The amount expended for work under the consolidated project was $172,408.37.

The river and harbor act of June 25, 1910, adopted a new project which supersedes all others and is in accordance with plan printed in House Document No. 752, Sixty-first Congress, second session. It provides for a channel depth of 7 feet at mean low tide from the head of navigation to the sea, and for the extension of the south jetty across the bar at the mouth, at an estimated cost of $55,000.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Breakwater [1]					1866	188
	Senate	44	Forty-eighth	First	1884	484
Mouth to Saco [1]	House	87	Forty-ninth	do	1886	552
Do.[1]					1887	458
Do.[1]	House	752	Sixty-first	Second		

[1] Contains maps.

The existing project has not been modified since its adoption. The work includes dredging, a small quantity of ledge excavation, repair of jetties, and the extension of the jetty on the south side of the mouth of the river.

During the fiscal year 1912 the repair of the jetties and the extension of the south jetty at the mouth of the river were completed. A small amount of work remains to be done at the north side of the shore end of the breakwater where the sea threatened to break through.

The dredging was commenced in October, 1911, suspended for the winter, resumed early in June, 1912, and by the close of the year about 26 per cent of it had been accomplished.

The total amount expended under the existing project is $25,847.34, of which the sum of $1,071.55 is regarded as for maintenance, being for repair of beacons on jetties built under a former project.

About 55 per cent of the work covered by the existing project has been completed.

The depths in the river have maintained fairly well, but the least depth at the mouth is about 3½ feet at mean low tide. The mean range in tides is 8.8 feet.

The head of navigation is at Saco and Biddeford, on opposite sides of the river, to which towns, about 5 miles above the bar, the river is navigable in fact. The stream above is devoted to water-power development and a small amount of lumbering.

The commerce for the calendar year 1911 amounts to 66,641 short tons, nearly all coal, with an estimated value of $300,000.

It is expected that the greater depth to be secured under the new project will reduce freight rates, largely through permitting vessels to go up river with full instead of partial cargoes, but the project is not yet sufficiently advanced to give much relief.

July 1, 1911, balance unexpended	$53, 608. 73
June 30, 1912, amount expended during fiscal year, for works of improvement	19, 364. 44
July 1, 1912, balance unexpended	34, 244. 29
July 1, 1912, outstanding liabilities	2, 926. 33
July 1, 1912, balance available	31, 317. 96
July 1, 1912, amount covered by uncompleted contracts	8, 247. 15

(See Appendix A 19.)

20. Kennebunk River, Me.—Kennebunk River is a small stream about 15 miles in length, flowing in a southeasterly direction and discharging into the Atlantic about 30 miles southwest of Portland Harbor, Me. Improvement has been confined to the section at and near the mouth.

By an act of Congress in 1798 provision was made for keeping in repair a pier built at the mouth of the river, and under subsequent projects, from 1829 to 1871, an easterly and westerly pier of stone at the mouth of the river, and a wharf of timber cribs filled with stone about 700 feet above the shore end of the easterly pier, appear to have been extended and maintained.

In 1876 the project was modified to obtain by dredging a channel of navigable width, not less than 4 feet deep at mean low water, from the mouth of the river up about 1⅛ miles to Kennebunkport, at an estimated cost of $5,000.

By 1893 the original and modified projects were completed. A westerly pier 600 feet long, an easterly pier 290 feet long, and a wharf 300 feet long appear to have been extended and maintained, and a channel of navigable width, 4 feet deep at mean low tide, obtained by dredging and rock excavation.

In December, 1902, an estimate was submitted, amounting to $3,500, for the repair of the two piers and the wharf, and this sum was appropriated for maintenance by the act of March 3, 1905.

On completion of this work the total expenditures amounted to $86,949.88.

The work of the past year consisted in the repair of the jetty and wing wall on the easterly side of the mouth of the river, for which an allotment of $3,000 was made in March, 1911, from appropriation for emergencies in river and harbor works. The work of repair was accomplished during September and October, 1911. The total cost was $1,778.42, the remainder of the allotment being returned to the Treasury to the credit of the appropriation.

A description of the improvement at the mouth of the river may be found in the Annual Report of the Chief of Engineers for 1870, page 506, and of the channel above the mouth, in the report for 1875, part 2, page 434.

For reports on preliminary examinations and surveys see Annual Reports of the Chief of Engineers for 1875, part 2, page 432 (H. Doc. No. 75, pt. 2, 43d Cong., 2d sess.); 1890, page 471 (H. Doc. No. 136, 51st Cong., 1st. sess.); and House Document No. 423, Sixty-second Congress, second session.

The maximum draft that can be carried at mean low water, over the shoalest portion, is probably about 4 feet. The mean range of tide is 9 feet.

The head of navigation is at Kennebunkport, to which point, 1⅛ miles from its mouth, the river is navigable in fact. The commerce is light, probably not exceeding 3,000 tons, chiefly coal.

July 1, 1911, balance unexpended	$3,125.34
June 30, 1912, amount expended during fiscal year, for work of maintenance	1,769.63
Balance returned to the Treasury to the credit of the appropriation	1,355.71

(See Appendix A 20.)

21. *Harbor at Isles of Shoals, Me., and N. H.*—Isles of Shoals lie in the open sea about 6 miles southeast of Portsmouth Harbor, N. H.

The most protected anchorage at Isles of Shoals, known as Gosport Harbor, lies between Star Island on the south and southwest, Cedar Island on the southeast, and Smuttynose Island on the north and northeast. At mean low water its anchorage of about 32 acres had a depth of 18 to 48 feet and none of its entrances less than 24 feet.

The original project of March 3, 1821, appears to have been to rebuild the small breakwater on the north side of Haleys Cove, projecting westerly from Smuttynose Island, and to build a breakwater or wall extending from Smuttynose Island to Cedar Island, directly protecting Gosport Harbor from easterly storms. The amount expended was $13,251.61.

The next project was adopted by the river and harbor act of June 13, 1902, and provided for the construction of a breakwater on the base of the breakwater built under the project of 1821, between Smuttynose and Cedar Islands, the upper part of which had been demolished to the level of 1½ feet above mean low tide. The estimate of cost was $30,000, and with the expenditure of $28,201.60 the breakwater was completed. The top was 15 feet above mean low tide.

The river and harbor act of June 25, 1910, adopted a new project in accordance with plan printed in House Document No. 1122, Sixtieth Congress, second session, which provides for construction of a breakwater from Cedar Island to Star Island, giving protection from the south and southeast. The estimated cost is $40,000, all of which is provided by the act of 1910.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Breakwater [1]	House	75 (Pt. 2)	Forty-third	Second	1875	421
Do.[2]	do	255	Fifty-sixth	First	1900	1172
Do.[2]	do	1122	Sixtieth	Second		

[1] No maps.

[2] Contains maps.

The existing project has not been modified since its adoption. A contract for construction of the breakwater has been made, and actual work began in May, 1912. At the close of the year about 23 per cent of the stone had been deposited.

The total expenditures under the existing project amount to $2,302.07, all for new work.

The mean tidal range is 8.7 feet.

The commerce is inconsiderable, amounting to but 3,230 short tons for the calendar year 1911, but the harbor is of value as a refuge in the open sea 6 miles off the coast.

July 1, 1911, balance unexpended	$39,419.07
June 30, 1912, amount expended during fiscal year, for works of improvement	1,721.14
July 1, 1912, balance unexpended	37,697.93
July 1, 1912, outstanding liabilities	5,301.06
July 1, 1912, balance available	32,396.87
July 1, 1912, amount covered by uncompleted contracts	21,753.47

(See Appendix A 21.)

22. *Pepperells Cove, Me.*—Pepperells Cove is on the easterly or Maine side of Portsmouth Harbor and about 1 mile within the entrance, and has never before been under improvement by the United States. The depth varies from 1 to 11 feet at mean low tide, and at the entrance there is a ledge with a depth of only about 5½ feet. These conditions make the cove of restricted value to vessels.

The existing project, adopted by the river and harbor act of June 25, 1910, is in accordance with plan printed in House Document No. 1081, Sixtieth Congress, second session, and provides for dredging an area of about 41 acres to a depth of 12 feet at mean low tide and for removal of the ledge to a depth of 12½ feet. The work was estimated to cost $158,400.

For reports on examinations and surveys see Annual Report of the Chief of Engineers for 1891, page 614 (H. Doc. No. 62, 51st Cong., 2d sess.), and House Document No. 1081, Sixtieth Congress, second session.

The dredging which was in progress at the close of the last fiscal year was continued, and a new contract with the same concern covering the remainder of the dredging has been made. At the close of the fiscal year 1912 about 76 per cent of all the dredging had been accomplished, or about 46 per cent of the project, all work done being in accordance with the project as adopted.

The ledge excavation will be undertaken after the dredging is completed.

The total expenditures have been $48,612.61, all for new work.

The mean range in tide is 8.7 feet.

Pepperells Cove itself has no commerce worthy of consideration as such. The purpose of the improvement is to increase the anchorage area for craft entering Portsmouth Harbor, and it is in connection with the latter that the project assumes importance. The improvement is not expected to directly affect freight rates, but to provide an anchorage and harbor for small vessels.

The commerce of Portsmouth Harbor for the calendar year 1911 is reported as 610,716 short tons, nearly all coal. The estimated value of the commodities is $2,762,822.

All the dredging will probably be completed by the close of the present working season. The new appropriation asked for is to be applied to the ledge excavation, which will be necessary to make the improvement safe and fairly available.

July 1, 1911, balance unexpended	$89,508.10
June 30, 1912, amount expended during fiscal year, for works of improvement	43,120.71
July 1, 1912, balance unexpended	46,387.39
July 1, 1912, outstanding liabilities	10,613.93
July 1, 1912, balance available	35,773.46
July 1, 1912, amount covered by uncompleted contracts	17,283.78
Amount (estimated) required to be appropriated for completion of existing project	[1] 63,400.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 63,400.00

(See Appendix A 22.)

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[1] Exclusive of the balance unexpended July 1, 1912.

23. Cocheco River, N. H.—This is a small stream in the southeastern part of New Hampshire. After flowing about 30 miles in a southeasterly direction it discharges into Piscataqua River about 9 miles above Portsmouth, N. H. The section which has been under improvement is that from Dover, at the head of navigation, a distance of about 3 miles.

Appropriations amounting to $10,060, made from 1829 to 1837, inclusive, had been applied to the reduction of obstructions in the natural channel prior to the systematic improvement of this river, begun in 1870, when it was found to have a good channel not less than 6 feet deep at mean low water from its confluence with the Piscataqua River to the Lower Narrows, about 1½ miles below the lowest bridge at Dover. Above the Lower Narrows the channel was obstructed by ledges and shoals upon which at mean low water the depth was from 6 inches to 2 feet. The original project for systematic improvement, adopted by the act of March 3, 1871, was to obtain a channel 40 feet wide and 4 feet deep at mean low water from the Lower Narrows to the head of navigation at Dover. Under the original and amended projects, completed in 1888, the amount expended prior to operations under the existing project, including the expenditures from 1829 to 1837, was $170,060.

The existing project, adopted by the act of September 19, 1890, is to obtain a channel 60 to 75 feet wide and 7 feet deep at mean low water (in rock 50 feet wide and 7½ feet deep) from the mouth of the river to the head of navigation, at an estimated cost of $175,000. By the act of June 13, 1902, this project was extended to include the restoration of the channel in the Lamprey River, which, from 1881 to 1883, under specific appropriations, had been dredged at mean high water 100 feet wide and 12 feet deep to the Lower Narrows, and 40 feet wide and 11 feet deep to the wharves at Newmarket, N. H.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Dover					1871	868
Do.[1]					1885	474
Dover to mouth [2]	House	74	Fifty-first	First	1890	475
Do.[2]	do	1106	Sixty-first	Third		

[1] Contains maps.

[2] No maps.

Except for the addition of the work in Lamprey River the existing project has not been amended since its adoption.

There were no operations during the fiscal year 1912, and no expenditures.

To June 30, 1912, there has been expended on the existing project for improving Cocheco River $137,000, as follows: Cocheco River, for improvement, $119,089.93; for maintenance, $9,642.54; for Lamprey River, for maintenance, $8,267.53. As a result the channel in Cocheco River has been completed except over a small portion about 3,500 feet below Dover, where some additional ledge excavation may be necessary, the basin at Dover and the channel near the mouth, where shoaling had occurred, have been redredged, and the channel in Lamprey River has been restored to the full authorized dimensions.

The maximum draft that can be carried in Cocheco River is about 6 feet at mean low tide, and in Lamprey River 11 feet at high tide.

The mean range of tide is 6.8 feet.

The head of navigation is at the lowest bridge in Dover, to which point, 3 miles from its confluence with the Piscataqua River and 13 miles from the sea, the Cocheco River is navigable in fact.

The commerce for the calendar year 1910 amounted to 14,845 short tons, nearly all coal.

The most noticeable effect on freight rates has been to cause a reduction of 33 per cent on rates on bituminous coal from Portsmouth to Dover. Formerly the rate was 60 cents per ton, which has been reduced to 40 cents to meet the water rate.

Some shoaling has occurred in the channels, but the small amount of business done on the river does not seem to justify at present anything for restoration.

July 1, 1911, balance unexpended	$4,711
July 1, 1912, balance unexpended	4,711

(See Appendix A 23.)

24. *Exeter River, N. H.*—Exeter River is a small stream in the southwesterly part of New Hampshire, flows about 20 miles in an easterly and northerly direction, and discharges into Great Bay. The portion which has been improved is from the mouth to Exeter, at the head of navigation, a distance of about 8.3 miles.

In its original condition at mean high water Exeter River was navigable from its mouth, in Great Bay, 7.8 miles, to Fernald's wharf in Exeter for vessels drawing 10 feet; thence to the upper wharves at Exeter, 0.5 mile, the depth was 5 feet.

The original project, adopted by the act of June 14, 1880, was to obtain a channel 40 feet wide from the mouth, 8.3 miles to the upper wharves at Exeter, 12 feet deep at high water 5.6 miles to Oxbow, and 10 feet deep from Oxbow to Exeter. Under this project the amount expended was $35,000, with which the original project was completed.

A second project, adopted by the act of March 3, 1899, was to obtain a channel 40 feet wide at mean high water, 12 feet deep to Oxbow, and 11 feet from Oxbow to Exeter, with a turning basin 200 by 110 feet at Exeter. This work was accomplished at a cost of $18,254.42.

The present project, adopted by the river and harbor act of February 27, 1911, is in accordance with plan printed in House Document No. 1090, Sixty-first Congress, third session, and provides for a restoration of the channel depths made under the project of 1899, with a slight straightening of the channel at Stratham Bridge. The estimated cost is $9,200.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Below Exeter [1]	House	75 (Pt. 2)	Forty-third	Second	1875	427
Mouth to Exeter [1]	do	41	Fifty-fifth	First	1897	818
Do.[2]	do	1090	Sixty-first	Third		

[1] No maps.

[2] Contains maps.

Work under the existing project, which has not been modified since adoption, was commenced July 5, 1911, and was completed early in the following September. At Stratham Bridge a small quantity of ledge was taken out. The rest was dredging.

The total expenditures on the existing project, which has been completed as planned, have been $9,094.11.

The mean tidal range is 6 feet.

The commerce for the calendar year 1911 amounted to 7,474 short tons, all coal.

July 1, 1911, balance unexpended	$9,166.07
June 30, 1912, amount expended during fiscal year, for works of improvement	9,060.18
July 1, 1912, balance unexpended	105.89
July 1, 1912, outstanding liabilities	55.00
July 1, 1912, balance available	50.89

(See Appendix A 24.)

25. Removing sunken vessels or craft obstructing or endangering navigation.—(*a*) *Wreck in Penobscot Bay, Me., southeast of Saddle Island.*—An obstruction was discovered in Penobscot Bay about five-eighths of a mile southeast from Saddle Island in 22 fathoms of water. Little information could be obtained, but indications were that it was the wreck of a three-masted schooner. The tops of the topmasts were about 19 feet below the surface. An allotment of $500 for removing the topmasts was made in June, 1911. The work was done in August, 1911, giving a clear depth of about 50 feet at mean low tide.

The total cost was $215.06.

(*b*) *Wreck of schooner Eleazer Boynton, Rockland Harbor, Me.*—This was a small wooden vessel, sunk by collision in Rockland Harbor August, 1911. An allotment of $1,000 was made October 11, 1911, for its removal. The wreck was broken up and removed in November, 1911. The total cost was $441.65.

(*c*) *Wreck of schooner Samuel J. Goucher, Portsmouth Harbor, N. H.*—The *Samuel J. Goucher* was a large five-masted wooden schooner. Loaded with 4,400 tons of bituminous coal, the vessel went ashore at Isles of Shoals November 10, 1911. The vessel was stripped and wrecked, but December 18, 1911, went adrift and was towed into Portsmouth Harbor by a revenue cutter. Allotments amounting to $2,500 were made for breaking up the wreck, which was completed in February, 1912. The total cost was $2,500. Some old timber and scrap sold for $379.

(See Appendix A 25.)

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and surveys required by the river and harbor act of June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. *Preliminary examination of Chandlers River, Me., with a view to its improvement by dredging from its mouth to Jonesboro.*—Report dated May 16, 1911, is printed in House Document No. 265, Sixty-second Congress, second session. The improvement of this stream is not considered worthy of being undertaken by the General Government at the present time.

2. *Preliminary examination of Northeast Harbor, Mount Desert, Me.*—Report dated August 31, 1911, is printed in House Document No. 358, Sixty-second Congress, second session. The improvement of this locality is not considered worthy of being undertaken by the General Government at the present time.

3. *Preliminary examination of Ogunquit Harbor, Me.*—Report dated September 30, 1911, is printed in House Document No. 419, Sixty-second Congress, second session. The improvement of this locality in the manner apparently desired is not deemed advisable at the present time.

4. *Preliminary examination of Kennebunk River, Me.*—Report dated March 22, 1911, is printed in House Document No. 423, Sixty-second Congress, second session. The improvement of this stream in the manner apparently desired by the interests concerned is not deemed advisable at the present time.

5. *Preliminary examination of Corea Harbor, Gouldsboro, Me.*—Report dated August 14, 1911, is printed in House Document No. 425, Sixty-second Congress, second session. The improvement of this harbor by the United States is not deemed advisable at the present time.

6. *Preliminary examination and survey of Portland Harbor, Me.*—Reports dated February 17 and November 24, 1911, with map, are printed in House Document No. 489, Sixty-second Congress, second session. A plan for improvement at an estimated cost of $460,000 for first construction, with $2,000 annually for maintenance, is presented.

7. *Preliminary examination and survey of South Bristol Harbor, Me., with a view to a channel 30 feet wide and 12 feet deep through the drawbridge.*—Reports dated November 26, 1910, and October 5, 1911, with map, are printed in House Document No. 564, Sixty-second Congress, second session. A plan for improvement at an estimated cost of $3,500, with a view to securing an available depth of 2

feet at mean low tide over the area shown on map, is presented, but the improvement of the locality by the General Government to the extent contemplated by the act is not deemed advisable.

8. *Preliminary examination, with plan and estimate of cost of improvement, of Medomak River, Me.*—Reports dated June 30, 1910, and February 21, 1912, with map, are printed in House Document No. 674, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $17,000 for first construction, with from $500 to $1,000 annually for maintenance, is presented.

The local officer was also charged with the duty of making other preliminary examinations and surveys provided for by the river and harbor act approved June 25, 1910, as follows, and reports thereon will be duly submitted when received:

1. *New Meadows River, Me.*

2. *Bass Harbor Bar and Deer Island Thoroughfare, Me.*

3. *Camden Harbor, Me.*, with a view to constructing a breakwater from the mainland to Negro Island.

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Reports on preliminary examinations and surveys required by the river and harbor act approved February 27, 1911, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. *Preliminary examination of Winter Harbor, Me.*—Report dated August 14, 1911, is printed in House Document No. 357, Sixty-second Congress, second session. The improvement of this harbor by the General Government is not deemed advisable.

2. *Preliminary examination of Bluehill Inner Harbor, Me.*—Report dated August 14, 1911, is printed in House Document No. 420, Sixty-second Congress, second session. The improvement of this harbor by the General Government in the manner apparently desired by the interests concerned is not deemed advisable at the present time.

3. *Preliminary examination of Rockland Harbor, Me., at and near Atlantic Point.*—Report dated September 30, 1911, is printed in House Document No. 421, Sixty-second Congress, second session. The improvement of this harbor in the manner apparently desired by the interests concerned is not deemed worthy of being undertaken by the General Government at the present time.

4. *Preliminary examination and survey, respectively, of Carvers Harbor, Vinalhaven, Me.*—Reports dated August 28, 1911, and January 24, 1912, with map, are printed in House Document No. 624, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $16,000 for first construction is presented.

5. *Preliminary examination and survey of Kennebec River, Me., channel west of Swan Island.*—Reports dated October 31, 1911, and January 13, 1912, with maps, are printed in House Document No. 746, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $30,500 for first construction, with $2,500 annually for maintenance, is presented.

IMPROVEMENT OF RIVERS AND HARBORS IN THE BOSTON, MASS., DISTRICT.

This district was in the charge of Col. Frederic V. Abbot, Corps of Engineers. Division engineer, Col. W. M. Black, Corps of Engineers.

1. *Newburyport Harbor, Mass.*—The water front of Newburyport is on the Merrimac River, about 2½ miles above the mouth and about 58 miles by water north of Boston. The river at this point is about one-fourth of a mile wide.

Prior to specific appropriations for Newburyport Harbor funds applicable to Merrimac River, of which it is the estuary, were devoted to removing a sand bar and constructing a breakwater at the river's mouth, 1828 to 1836, and to removing obstructing ledges, piers, and wrecks, 1870 to 1880. In its original condition the outlet of the Merrimac River, which between Plum Island and Salisbury Point was 1,000 feet wide and 30 feet deep at mean low water, was obstructed by a sand bar, nearly a mile outside, through which, in 1880, a narrow channel about 7 feet deep at mean low water was maintained by the current of the river.

The original project adopted by the act of June 14, 1880, which is the existing project, is published in the Annual Report of the Chief of Engineers for 1881, page 502, and is to create at the outer bar a permanent channel 1,000 feet wide, and at least 17 feet deep at mean low water, by constructing two converging jetties, projecting, one from the north shore 2,910 feet, the other from the south shore 1,500 feet (reduced in 1883, in changing its direction, to 1,320 feet), their outer ends 1,000 feet apart, which, with the protection of the beach in their vicinity, was estimated in 1881 to cost $365,000. The direction of jetties and shore protection was modified in 1883, and in 1882 the partial closing of Plum Island Basin with a timber dike about 800 feet long and 5½ feet above mean low water was added to the project, increasing the cost (as estimated in 1884) to $375,000. In 1884 a modification of the project provided for extending both jetties 610 feet parallel to the axis of the channel, and in 1886 for increasing the extension to 1,000 feet, increasing the cost of the work, as estimated in 1897, to $599,547.49.

The modification of 1884 changed the direction of both the north and south jetties from straight jetties ending in circular mounds to bent jetties. In each jetty the change of direction was made on a gradual curve, the jetties converging until their center lines were 1,000 feet apart, and then extending parallel for a distance of 1,000 feet (as expressed in 1886). The 1,000-foot parallel extension of the jetties being thus estimated from a point where convergence ceases instead of from the center of the mounds at the outer ends of the jetties as formerly proposed, the total lengths of the jetties as now projected are respectively 4,118 feet for the north jetty and 2,445 feet for the south jetty.

The river and harbor act of June 25, 1910, authorized dredging to be included as a part of the existing project.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entrance to Newburyport Harbor, adopted plan of jetties, 1880.[1]					1881 [2]	502 504–511
Partial closing of Plum Island Basin.[1]					1882 [3] 1884 [2]	509 497
Modifications in jetties and shore protection, 1883 and 1884.[1]					1883 [2] 1884 [2]	437 494
Parallel extension of jetties, 1886; with increased estimate, 1897.[1]					1886 [3] 1897 [3]	558 825
Surveys of bar and entrance:						
1885					1885 [2]	496
1886					1886 [2]	559
1887					1887 [2]	491
1888					1888 [2]	434
1889					1889 [2]	556
1890					1890 [2]	488
1891					1891 [2]	627
1892					1892 [2]	563
1893					1893 [2]	741
1894					1894 [2]	531
1895					1895 [2]	599
1897					1897 [2]	825
1899					1899 [3]	1059
1901					1901 [2]	1043
1905					1905 [2]	802
1906, with estimate for removing obstructions at mouth.	House	[2] 339	Fifty-ninth	Second		
1910					1910 [3]	1099

[1] Existing project June 14, 1880, and its modifications.
[2] Contains maps.
[3] No maps.

The existing project, as modified from time to time, is to create a permanent channel through the outer bar 1,000 feet wide and at least 17 feet deep at mean low water by constructing two jetties, projecting, one from the north shore and the other from the south shore, converging until 1,000 feet apart, and then extending seaward parallel to the axis of the channel for a distance of 1,000 feet; total length of north jetty, 4,118 feet; of south jetty, 2,445 feet; and the partial closing of Plum Island Basin by a timber dike. Dredging through the bar, if found necessary, is also included in the project.

The expenditures during the fiscal year ($30,375.01) were applied to bringing such portions of the core of the north jetty as were uncompleted at the close of the previous fiscal year up to the required height of 12 feet above mean low water, with a width of 5 feet on top, and the building of a core to the same grade and cross section over the remaining 625 feet of the jetty to its outer end. In all, 23,158 tons were deposited. Surveys of the bar and entrance channel were made in August-September, 1911, and in June, 1912. All work was for improvement.

To June 30, 1912, the amount expended on this project was $440,688.88, of which $10,389.68 was for maintenance. In addition, $500 was expended in 1901 for removal of North Rock under authority of act of March 3, 1899. By way of refundment, $795.31 was recovered from a failing contractor.

The project is about 85 per cent completed. The north jetty has been completed to its full cross section for a length of 2,868 feet, and a core 12 feet above mean low water, with a width of 5 feet on top, has been built for a further distance of 1,250 feet to its outer end. The south jetty has been completed, except for a distance of 30 feet at its outer end; the Plum Island Basin has been closed with a timber dike 817 feet long, 5½ feet high above mean low water, except near the middle, where a weir 150 feet long and 2 feet above mean low water was left temporarily, and two sand catchers, respectively 480 and 572 feet in length, have been built in rear of the south jetty.

Both jetties, so far as completed, are 15 feet wide on top, which is in a plane 12 feet above mean low water, and have slopes of 1 on 2 on the seaward face and 1 on 1 on the shoreward face.

June 30, 1912, the maximum draft that can be carried over the bar at mean low water is 11 feet. The mean range of tide is 7.7 feet.

The commerce of the harbor, chiefly coal, amounted in 1910 to 181,401 short tons, and in 1911 to 217,301 short tons, valued at $863,099.50. Of the latter amount, 108,686 tons were reshipped to points on the Merrimac and Powow Rivers.

It is reported that the improvement made has reduced freight rates 25 cents per ton, and that if the projected depth of 17 feet at mean low water be obtained over the outer bar it would still further reduce the freight rates 15 to 25 cents per ton.

The appropriation recommended will be applied to continuing improvement by increasing the cross section of the core of the north jetty.

July 1, 1911, balance unexpended	$38,481.44
June 30, 1912, amount expended during fiscal year, for works of improvement	30,375.01
July 1, 1912, balance unexpended	8,106.43
July 1, 1912, outstanding liabilities	106.43
July 1, 1912, balance available	8,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1]159,369.28
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1]25,000.00

(See Appendix B 1.)

2. *Merrimac River, Mass.*—The Merrimac River is formed by the confluence of the Pemigewasset and Winnepesaukee Rivers at Franklin, N. H. It flows southerly through the State of New Hampshire, enters the State of Massachusetts above Lowell, whence it flows in an easterly direction, and discharges into the Atlantic Ocean at Newburyport, Mass., about 55 miles by water north of Boston. Its total length is about 110 miles. Only that section of the river between Newburyport (about 2½ miles above the mouth) and Haverhill, Mass., covering a distance of 16¼ miles, is included in the project.

In its original condition the river had a practicable channel 7 feet deep at mean low water from its mouth 9 miles to South Amesbury, but besides being narrow and crooked the channel was obstructed by ledges, bowlders, and shoals.

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[1] Exclusive of the balance unexpended July 1, 1912.

The original projects appear to have been—

(1) For improving the bar at the mouth of the river, by erection of piers or other works, adopted by act of May 23, 1828; subsequently improved under separate project for "Improving harbor at Newburyport, Mass."

(2) For the improvement of the river above the mouth, by the removal of the remains of a dam at the upper falls and of a rock at the lower falls, of Gangway rock in Newburyport Harbor, and a wreck near the mouth of the river.

Upon the original and modified projects, prior to operations under the existing project, there was expended: Upon the project of 1828, $67,466.72, and upon the project of 1870, as extended by the acts of June 23, 1874, and June 3, 1896, which appropriated $5,000 for removal of "certain rocks below Rocks Bridge," $187,000; total, $254,466.72.

The existing project, adopted by the act of March 3, 1899 (H. Doc. No. 52, 55th Cong., 1st sess.), is to obtain a channel 7 feet deep at mean low water, 150 feet wide, from Newburyport, 16½ miles, to Haverhill, at an estimated cost of $171,442.70. No modification has been made in this project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Near mouth of river, and thence to above Haverhill: [1]						
1869	House	[2] Ex. 26	Forty-first	Second	[2] 1869	421
1872					[2] 1873	1112
1874					[2] 1876	165
1896					[2] 1896	590
Newburyport to Haverhill, 1897 [3]	House	[2] 52	Fifty-fifth	First	[2] 1897	865
Newburyport bar to Haverhill, 1894-95	do	[4] 168	Fifty-fourth	do	[2] 1896	616
Hazeltine Rapids to Lawrence, 1871					[2] 1872	961
Lawrence, Mass., to Manchester, N. H., 1881					[2] 1882	532
Lowell to old New Hampshire State line, 1897	House	[4] 242	Fifty-fifth	Second	[2] 1898	884
Newburyport to Haverhill, 9-foot channel, 1903	do	[2] 311	Fifty-eighth	do	[2] 1904	872
Newburyport to Haverhill, 12-foot channel, 1906	do	[2] 339	Fifty-ninth	do		
Removing obstructions at mouth, 1906	do	[4] 339	do	do		
Mouth of river to Haverhill, 14-foot channel, 1908	do	[4] 2	Sixty-first	First		
Haverhill to Lowell, 1910	do	[2] 9	Sixty-second	do		

[1] Project of 1870 as extended 1874 and 1896.

[2] No maps.

[3] Existing project, Mar. 3, 1899.

[4] Contains maps.

During the working season of 1911 the channel was redredged to the projected width and depth from Haverhill downstream nearly through Curriers Shoal, 19,232.361 cubic yards (including 410 cubic yards in previous fiscal year) being removed at an expenditure of

$18,902.16, all for maintenance. No work was done during the working season of 1912. Redredging is necessary from the lower end of Curriers Shoal to just below Rocks Bridge, but the small balance of funds remaining is not sufficient to complete the work.

The amount expended on the existing project to June 30, 1912, was $188,500.10, of which $23,075.33 was applied to maintenance of improvement. From sales, $2.08 was derived.

The channel was completed to the full projected depth and width in December, 1907, since which time it has been maintained by redredging and removal of bowlders.

June 30, 1912, the maximum draft that can be carried at mean low water over the shoalest part of the improved channel is 7 feet.

The mean range of tide is, at the mouth of the river, 7.7 feet, and at Haverhill Bridge 4.6 feet, at low-water stage of the river.

The head of navigation is at the hat factory, one-half mile above the railroad bridge at Haverhill, to which point the stream is navigable in fact, about 20 miles above its mouth in Newburyport Harbor.

The commerce of the river is chiefly in coal distributed to the cities and towns along its banks, and amounted in 1910 to 102,178 short tons and in 1911 to 108,686 short tons, valued at $485,618.70. The improvement of the channel is reported to enable the delivery of coal by water at rates 35 to 50 cents per ton less than by rail.

The appropriation recommended will be applied to maintenance of the dredged channel.

July 1, 1911, balance unexpended	$15, 402. 16
Receipts from sales	1. 98
	15, 404. 14
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	13, 902. 16
July 1, 1912, balance unexpended	1, 501. 98
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 10, 000. 00

(See Appendix B 2.)

3. Essex River, Mass.—Essex River has its rise in Essex County, Mass. It flows for about 6 miles in a northeasterly direction and empties into Ipswich Bay. The length of the section included in the project is 2¼ miles, commencing 2½ miles from the mouth.

In its original condition the river had a channel not less than 6 feet deep at mean low water from its mouth in Ipswich Bay for a distance of about 2½ miles; but thence for 2¼ miles to the head of navigation in fact, at the railroad bridge at Essex, the channel was narrow, crooked, and shallow, having a greatest continuous depth of 1.7 feet, navigation being further impeded by bowlders obstructing the channel.

The original project, adopted July 13, 1892, which is also the existing project, is to obtain a channel 4 feet deep at mean low water and 60 feet wide to the then head of navigation (at the railroad bridge in Essex), at an estimated cost of $25,000; modified, March 23, 1899, by limiting the improvement to the channel below the highway bridge at Essex, which had been rebuilt without a draw.

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[1] Exclusive of the balance unexpended July 1, 1912.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to wharves at Essex, Mass.[1]					[2] 1891	676
Do	House	[3] 68	Fifty-ninth	First		

[1] Existing project, July 13, 1892, before modification. [2] Contains maps. [3] No maps.

The existing project, as modified, is to obtain a channel 4 feet deep at mean low water, and 60 feet wide, to the highway bridge at Essex.

No work was done during the fiscal year 1912.

To June 30, 1912, the amount expended was $30,000, of which $21,759.21 was for improvement.

The sum of $8,240.79, with an additional $5,000 which was appropriated by the State of Massachusetts, was applied to maintenance.

The project was completed in 1901, since which time the improvement has been maintained by redredging and removing bowlders.

The maximum draft that can be carried, June 30, 1912, over the shoalest part of the locality under improvement is 4 feet. The mean range of tide is 8.8 feet. The head of navigation is at the highway bridge at Essex, to which point, a distance of 4¾ miles from its mouth, the river is navigable in fact.

No freight is carried on the river, but the improvement permits annually the exit of a few fishing schooners which are built on the river.

So far as can be learned this industry is diminishing. Repeated efforts have been made annually to get the boat builders to submit statistics as to the number of vessels built each year, but no satisfactory replies could be obtained. In view of the diminishing importance of building wooden vessels, and of the fact that the improvement is very local in character, amounting simply to the fostering of a few minor boat-building yards, this river is no longer considered worthy of the cost of maintenance by the United States.

No further annual reports will be submitted.

(See Appendix B 3.)

4. Harbor of refuge, Sandy Bay, Cape Ann., Mass.—Situated at the northeastern extremity of Cape Ann, about 13 miles by water northeast of Gloucester Harbor.

In its original condition this bay, whose southerly shore extends about 2 miles westerly from the point of Straitsmouth Island and thence about 2 miles northerly to Andrews Point, had a good holding ground of sand mixed with mud and a depth of 7½ to 15 fathoms at mean low water, but was fully exposed to easterly, northeasterly, and northerly gales.

The original project, adopted by the act of July 5, 1884 (S. Ex. Doc. No. 74, 48th Cong., 1st sess.), was to build a breakwater consisting of a mound of rubblestone to the grade of 22 feet below mean low water, 40 feet wide on top, to be surmounted by a masonry wall, and to extend from Averys ledge a little west of north 3,600 feet to Abners ledge, thence 5,400 feet northwesterly in the direction of Andrews Point, covering an anchorage of about 1,377 acres.

This project (so far as length and general location of the breakwater are concerned) is the existing project, but the locality is so exposed to extreme storm conditions that as work progressed it was found necessary to increase the width of base and to modify the character of the originally projected masonry wall forming the superstructure. These changes were made successively, under authority of the War Department, and were reported to Congress in the annual reports. A special board submitted a report on February 13, 1900, published in House Document No. 453, Fifty-sixth Congress, first session, which discusses fully all experience up to that date, proposed a new cross section, and submits a revised estimate for the project amounting to $6,904,952.25. The winter storms of 1908–9 proved even that cross section to be insufficient, and a new modification was made in that year. This has resisted successfully one of the heaviest storms (in November, 1909) occurring in the past 20 years on the New England coast, and a length of 800 feet of this cross section will be completed with funds so far provided by Congress. It now seems wise to await the test of this latest cross section by storms, ice, and the expansion due to summer heat before doing any additional actual construction. No additional funds are therefore asked at this time. A less length than 800 feet might not have developed the full force of waves with crests approximately parallel to the face of the breakwater which would break simultaneously against the whole length of such a superstructure. The cross section adopted by the board and the latest cross section are shown as sections D and C, respectively, on sheet 2 of the drawings accompanying the report of the district engineer for 1911 (Appendix B 4).

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Survey of Sandy Bay, with view to construction of harbor of refuge, 1882-83.[1]	Senate	[2] Ex. 74	Forty-eighth	First	1884 [3]	565
Consideration of proper location for national harbor of refuge, 1884.	House	[2] Ex. 56	do	Second	1885 [3]	522
Proposed breakwater, 1883					1886 [2]	582
Progress made on construction of breakwater and as to expediency of completing, 1886.	Senate	[3] Ex. 147	Forty-ninth	First		
Survey of portion of substructure					1887 [2]	490
Report of board upon plans for substructure and superstructure, 1892.					1892 [2]	560
New cross section, details of construction, and revised estimate of cost, 1900.	House	[2] 453	Fifty-sixth	First	1900 [2]	1184
	Senate	[2] 184	do	do		
Condition of breakwater June 30, 1902.					1902 [2]	854
Feasibility and advisability of continuing to completion the adopted project, 1902.					1903 [2]	742

[1] Original project. [2] Contains maps. [3] No maps.

During the fiscal year ending June 30, 1912, 97.2 linear feet of the superstructure of the southern arm were rebuilt into the new type of cross section, and 90.8 linear feet of new superstructure of the same type were built on the western arm. Expenditures, $66,037.31, all for improvement.

The amount expended under the existing project, to June 30, 1912, not including outstanding liabilities, was $1,746,482.13, all for improvement. From sale of property $1 has been derived. With this expenditure 2,068,295 tons of rubblestone has been placed in the substructure of the western and southern arms, and 17,720 tons of dimension stone and 15,859 tons of rubblestone in the superstructure of the western and southern arms.

The depth of water is ample for the largest vessels; the mean range of tide is 8.6 feet.

The improvement is chiefly of value in providing refuge for coastwise vessels, especially towed barges, which are frequently and suddenly in urgent need of shelter in fog and snowstorms.

The work already done has resulted in the creation of a serious menace to navigation until the submerged substructure is protected and made visible by a suitable superstructure. Under these conditions the district officer is of the opinion that the locality is worthy of improvement to the extent of completing the superstructure for the full length of the present substructure at least. When this has been accomplished the advisability of completing the structure to its full projected length can be taken up with more satisfactory data on which to base recommendations.

July 1, 1911, balance unexpended	$269,556.18
June 30, 1912, amount expended during fiscal year, for works of improvement	66,037.31
July 1, 1912, balance unexpended	203,518.87
July 1, 1912, outstanding liabilities	30.00
July 1, 1912, balance available	203,488.87
July 1, 1912, amount covered by uncompleted contracts	176,400.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 4,954,952.25

(See Appendix B 4.)

5. *Harbor at Gloucester, Mass.*—Situated at the southern extremity of Cape Ann, distant about 30 miles northeast by water from Boston Harbor. The outer harbor has an area behind the breakwater of approximately 350 acres at the 18-foot contour, and the inner harbor about 80 acres at the 12-foot contour.

In its original condition this harbor, which had a depth sufficient for the largest ships, contained several very dangerous submerged rocks and was entirely without protection against the sea and against heavy swells from the south.

The original project, adopted by the act of June 10, 1872, appears to have been for removal of five rocks, at an estimated cost of $10,606.20.

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[1] Exclusive of the balance unexpended July 1, 1912.

Under the original and modified projects the rocks were removed, Harbor Cove was dredged to the depth of 10 feet at mean low water, and the water front for a distance of 3,900 feet northeast from Fort Point was dredged to a depth of 15 feet at mean low water from the 15-foot contour to the wharf front, upon which there was expended prior to operations under the existing project approximately $86,000.

The project adopted by the act of August 18, 1894, provided for the construction of a breakwater from Eastern Point, over Dog Bar, to Round Rock Shoal at an estimated cost of $752,000; and the act of June 13, 1902, authorized the termination of the breakwater at Cat Ledge and the application of any remaining balance "toward the work of removing Round Rock," at a reduced estimate of $416,083.43. Under that authority the breakwater was completed in 1905 as far as Cat Ledge. Upon a subsequent examination of Round Rock Shoal it was found that the cost of removing it to the level of the surrounding bottom, exceeding $800,000, was disproportionate to the probable benefits to navigation. The project has been reviewed by the Board of Engineers for Rivers and Harbors, which recommends return to the original project of 1894 for a breakwater from Eastern Point to Round Rock Shoal, and its views are concurred in. The total cost of this extension is estimated at $354,000.

The river and harbor act of February 27, 1911, appropriated $15,000, which is being applied to protecting the seaward slope of the substructure of the breakwater at the toe of the seaward wall of the superstructure by an apron of rubblestone.

The river and harbor act of June 25, 1910 (H. Doc. No. 1112, 60th Cong., 2d sess.), provided for the removal of eight groups of obstructing ledges or bowlders in the inner and outer harbors at a total estimated cost of $51,000.

References to examination of survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Upper harbor, 1870, removal of rocks.[1]					1871 [2]	869
Removal of rock obstructions, 1884 [1]	House	[2] Ex. 169	Forty-eighth	Second	1885 [2]	540
Modifications, 1886, removing rock, and dredging; additional rocks, 1897.[1]					1887 [2] 1897 [2]	500 835
Dog Bar and Round Rock shoal (with view to construction of breakwater) 1870.[4]					1871 [2]	869
For breakwater at entrance of harbor, 1884.[4]	House	[2] Ex. 56	Forty-eighth	Second	1885 [2]	584
Breakwater as recommended in project (1884, 1886.)[4]					1887 [2]	500
Breakwater (adoption and commencement of work, 1894.[4]					1895 [2]	610
Revised project for construction of breakwater, 1897.[4]					1898 [2]	857
Terminating breakwater at Cat Ledge and application remaining funds to removal Round Rock, act June 13, 1902.[4]					1902 [2]	89
Removal of ledges, 1907-8 [5]	House	[3] 1112	Sixtieth	Second		
Five Pound Island to head of river, 1892.	do	[2] Ex. 70	Fifty-second	do	1893 [2]	787
Vincent Cove, 1892	do	[2] Ex. 56	do	do	1893 [2]	789

[1] Original project and modifications.

[2] Contains maps.

[3] No maps.

[4] Project for breakwater.

[5] Project for rock removal, June 25, 1910.

The project of August 18, 1894, as modified, provides for the construction of a breakwater from Eastern Point to Cat Ledge (completed in 1905) and the application of any remaining balance "toward the work of removing Round Rock," but the Board of Engineers for Rivers and Harbors has recommended return to the original project, i. e., for a breakwater from Eastern Point to Round Rock Shoal, and its views are concurred in, but no Congressional action has been taken on this recommendation.

No modification has been made in the project of June 25, 1910 (for removal of eight groups of ledges).

During the fiscal year 14,991 tons of stone were deposited in providing additional protection along the sea face of the breakwater, at an expenditure of $9,061.78 chargeable to maintenance.

The bids received in 1911 for the removal of seven of the eight groups of ledges embraced in the project having been rejected, the work was readvertised during the fiscal year and the removal of the entire eight groups of ledges contracted for. About 17 per cent of the entire ledge area was drilled and blasted.

The expenditure, amounting to $902.04, was all for improvement.

The amount expended under the project of August 18, 1894, to June 30, 1912, was $421,085.06, of which $9,306.22 was for maintenance—resetting and pinning capstones, protecting sea face of breakwater with apron of rubblestone, etc.

To June 30, 1912, the amount expended under the project of June 25, 1910 (for ledge removal) is $3,026.41, all for improvement.

The breakwater was completed to Cat Ledge in 1905 by the placing of 231,756 tons of stone. Since then, in 1911 and 1912, 16,344 tons have been placed in providing additional protection along the sea face.

The breakwater consists of a mound of rubblestone 31 feet wide at the top at mean low water, surmounted by a superstructure extending 17 feet above the grade of mean low water, formed by two dry walls of heavy split stone, inclosing a core of rubblestone, capped by heavy stones, forming a top course 10 feet in width, the slopes of the rubble structure being on the harbor side 1 on 1.3, on the seaward side 1 on 3 to grade 12 below mean low water, and 1 on 1.5 thence to the bottom.

At the outer end a rubble mound for a site for a lighthouse has been built.

The project of June 25, 1910, for ledge removal, is about 10 per cent completed. About 17 per cent of the entire area has been drilled and blasted, but no rock has yet been removed.

The maximum draft that can be carried June 30, 1912, at mean low water over the shoalest part of the locality under improvement is 10 feet in Harbor Cove, 15 feet along the wharf front, and 30 feet in the anchorage under the breakwater.

The mean range of tide is 8.9 feet.

The commerce in 1906 amounted to 275,888 short tons; in 1908 to 209,074 short tons; in 1909 to 218,165 short tons; in 1910 to 214,266 short tons; and in 1911 to 199,545 short tons, valued at over $10,000,000, of which latter 132,893 tons were fish and salt. About 42,000 passengers were carried to and from this port by steamer.

Freight rates are probably not affected, as the principal industry is fishing.

July 1, 1911, balance unexpended		$41,935.35
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$902.04	
For maintenance of improvement	9,061.78	
		9,963.82
July 1, 1912, balance unexpended		31,971.53
July 1, 1912, outstanding liabilities		4,272.41
July 1, 1912, balance available		27,699.12
July 1, 1912, amount covered by uncompleted contracts		20,219.28

(See Appendix B 5.)

6. *Harbor at Beverly, Mass.*—A small harbor about one-half mile wide at the western end of Salem Bay and immediately adjacent to Salem Harbor on the south, from which it is separated by Salem Neck.

In its original condition this harbor had a practicable channel 18 feet deep at mean low water from Monument Bar beacon about 1 mile to its head, about 600 feet below the highway bridge, sufficient for the commerce of the harbor and of its three tributary streams, called, respectively, North River, Essex Branch, and Beverly Creek; but the channel, which is circuitous in its passage through the shoals at the entrance, was found, in 1900, to be "of insufficient width for safe navigation by heavy vessels."

The original project, adopted by the act of June 13, 1902, was to widen the channel from Monument Bar beacon to a point about 200 feet east of Rams Horn beacon to a width of 200 feet, with a depth of 18 feet at mean low water, at an estimated cost of $10,000. Upon the original project, prior to operations under the existing project, $8,272.10 was expended, with which the channel was enlarged to the dimensions authorized, except at three points, where the width was restricted by ledges to 106 feet.

The existing project, adopted by the act of March 2, 1907 (H. Doc. No. 916, 59th Cong., 1st sess.), is to obtain, by dredging and rock excavation, a channel 18 feet deep at mean low water, not less than 250 feet wide at the bend for a distance of about 3,200 feet from Bar beacon to Lobster Rocks beacon, including the removal of the middle ground, and not less than 200 feet wide from Lobster Rocks beacon to the lower end of the draw pier at the highway bridge, a distance of 2,000 feet, at an estimated cost of $40,000. In addition to $1,727.90 available, $38,500 was appropriated. No modification has been made in the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Beverly Harbor:						
1889	House	[1] Ex. 27	Fifty-first	First	1890 [2]	524
1899	do	[2] 52	Fifty-sixth	do	1900 [2]	1183
1900 [3]	do	[2] 129	do	Second	1901 [2]	1065
1905-6 [4]	do	[1] 916	Fifty-ninth	First		
Salem and Beverly outer harbors, 1910.	do	[2] 79	Sixty-second	do		

[1] Contains maps.

[2] No maps.

[3] Project of 1902.

[4] Existing project, Mar. 2, 1907.

No work was done and no expenditures made during the fiscal year.

The amount expended on the existing project to June 30, 1912, was $26,865.14 (all for improvement, except $15 expended in fiscal year 1911 for making an examination of a shoal complained of by navigation interests, but which was found to be outside the limits of the improved channel).

By way of refundment, $122.24 was received as damages from the surety of a failing contractor under the previous project.

All work under the project was completed in November, 1909.

The maximum draft that can be carried on June 30, 1912, at mean low water over the shoalest part of the locality under improvement is 18 feet. The mean range of tide is 9 feet.

The commerce of Beverly Harbor consists chiefly of coal and building materials, amounting in 1908 to 223,933 short tons: in 1909 to 196,203 short tons; in 1910 to 204,697 short tons; and in 1911 to 244,623 short tons (valued at $1,464,354.73), of which 157,539 tons was coal.

The improvement to 18-foot depth has effected a reduction in freight rates of 25 cents per ton on bituminous coal.

July 1, 1911, balance unexpended	$13,485
July 1, 1912, balance unexpended	13,485

(See Appendix B 6.)

7. *Harbor at Lynn, Mass.*—Lynn Harbor is distant about 14 miles by water in a northeast direction from Boston Harbor. Is about 3 miles in extent from north to south and has an average width east and west of about 1½ miles, the greater part being bare at low water.

In its original condition three narrow and crooked channels, in which the depth was but 6 feet at mean low water, extended from the wharves to the sea.

The original project, defined in the report of a board of engineers dated April 10, 1884, and as modified in 1888, was to dredge a channel 200 feet wide and 10 feet deep at mean low water from the sea (at White Rocks), a distance of 3,300 feet to a deep basin opposite Little Nahant, and from the basin nearly opposite Sand Point, a distance of 6,900 feet to a point 400 feet inside the harbor line, and an anchorage basin 500 feet by 300 feet and 10 feet deep at mean low water; the upper part of the channel to be maintained by occasional dredging, the lower part by a training wall joining the land at Little Nahant, at an estimated cost of $182,000.

The amount expended on this project was $122,063.56, all for improvement, with which the entire channel and the anchorage basin as prescribed in the project were completed.

The project adopted by the river and harbor act of June 13, 1902, was to dredge a channel 200 feet wide, 4,500 feet long from the sea to the deep basin opposite Little Nahant; from the basin nearly opposite Sand Point, a distance of 7,000 feet to the anchorage basin, and the anchorage basin itself, 500 feet by 300 feet, all to the depth of 15 feet at mean low water, at an estimated cost of $162,937. The projected channel and basin were completed in May, 1908. Under the project to the close of the fiscal year ending June 30, 1912, $166,373.44 was expended; $164,373.44 being for improvement and $2,000 (in the fiscal years 1911 and 1912) for maintenance.

The existing project was adopted by the river and harbor act of June 25, 1910 (H. Doc. No. 948, 60th Cong., 1st sess.), and provides for the widening, to the same depth, and straightening the present channel and turning basin so as to make the former 300 feet wide and the latter 500 feet square, at a total estimated cost of $179,000. No modification has been made in the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Lynn Harbor:						
1881[1]	Senate	[2] Ex. 45	Forty-seventh	First	1882[2] 1884[3] 1888[2]	544 524 446
1897	House	[3] 28	Fifty-fifth	do	1897[2]	872
1900[4]	do	[3] 78	Fifty-sixth	Second	1901[2]	1092
1907-8[5]	do	[2] 948	Sixtieth	First		

[1] Original project.
[2] No maps.
[3] Contains maps.
[4] Project of June 13, 1902.
[5] Existing project, June 25, 1910.

During the fiscal year, $9,086.29 was expended (for improvement) in completing the removal of a shoal about 4,500 feet long along the western side of the inner channel; and $983.93 was expended for maintenance in restoring the 200-foot channel adjacent to that shoal, to the depth of 15 feet.

The total amount expended under the existing project to June 30, 1912, was $55,500, all for improvement.

The project is about 37 per cent completed. A shoal along the western side of the inner channel, 4,500 feet long and about 100 feet wide, has been removed to the depth of 15 feet at mean low water, a total of 231,265 cubic yards having been dredged and paid for.

The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality under improvement is 15 feet at mean low water. The mean range of tide is 9.3 feet.

The commerce of the harbor benefited by the improvement consists chiefly of coal, lumber, and building materials, and amounted in 1910 to 433,808 short tons and in 1911 to 478,574 short tons, valued at about $1,800,000. The deepening of the channel to 15 feet enables the smaller or medium-size barges to carry full cargoes of coal to the wharves at all stages of the tide and barges of the greatest draft during the higher stages.

It is reported by local commercial interests that the cost of transportation was reduced 25 cents a ton by deepening the channel to 10 feet and further diminished by increasing the depth to 15 feet.

The appropriation recommended will be applied to completion of the existing project.

Under a provision in the river and harbor act of July 13, 1892, $5,000 of the appropriation for Lynn Harbor was expended on the western (or Saugus River) channel in Lynn Harbor in obtaining a channel 8 feet deep at mean low water, and 150 feet wide, for an aggregate length of 2,200 feet. This channel has since deteriorated and for making a survey and restoring the channel to its former dimensions $5,000 was allotted on June 25, 1912, from the appropriation provided by the river and harbor act of March 2, 1907, for emergencies in rivers and harbors. At the close of the year work had not been commenced.

July 1, 1911, balance unexpended		$17,570.22
Amount allotted from emergency appropriation act approved Mar. 2, 1907		5,000.00
		22,570.22
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$9,086.29	
For maintenance of improvement	983.93	
		10,070.22
July 1, 1912, balance unexpended		12,500.00
Amount appropriated by river and harbor act approved July 25, 1912		35,000.00
Amount available for fiscal year ending June 30, 1913		47,500.00
Amount (estimated) required to be appropriated for completion of existing project		[1] 84,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[1] 84,000.00

(See Appendix B 7.)

8. Mystic and Malden Rivers and Mystic River below the mouth of Island End River, Mass.—(*a*) *Mystic River.*—This river rises in Mystic Lakes, Mass., and after flowing about 7 miles in a southeasterly direction, empties into Boston Harbor near the Charlestown Navy Yard.

The sections under improvement are embraced in two projects: One from the head of navigation at Medford (5 miles above the mouth) downstream to the Boston & Maine Railroad (western division) bridge, a distance of about 3 miles; the other, commencing at the downstream side of the Chelsea Bridge, near the mouth of the river, and extending to the mouth of Island End River, a distance of about one-half mile. The depth of water between the mouth of Island End River and the railroad bridge is sufficient for the commerce using the upper portion of the Mystic River and is not included in either project.

In its original condition the Mystic had a practicable channel 6 feet deep at mean low water, extending to Dennings Landing, 3.9 miles above its mouth in Boston Harbor, and 4 feet deep at mean low water about 2,000 feet farther.

The original project for improvement, adopted by the act of July 13, 1892, which is also the present project, is to make the channel 100 feet wide and 6 feet deep at mean low water from the Boston & Maine Railroad (western division) bridge up about 1 mile to the first turn above Denning's Wharf; and thence 2 miles to the head of navigation at Medford, 4 feet deep at mean low water, gradually narrowing from 100 feet to 50 feet at the upper end, at an estimated cost of $25,000. No modification has been made in the existing project since its adoption.

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[1] Exclusive of amount available for fiscal year 1913.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Upper Mystic, 1890-91 [1]					1891 [2]	672
To upper limits of Somerville, 1905	House	[3] 145	Fifty-ninth	First		

[1] Existing project, July 13, 1892.
[2] Contains maps.
[3] No maps.

No work was done and none required during the past year in maintenance of the improvement.

The amount expended to the close of the fiscal year June 30, 1912, was $28,994.88, all for improvement, except $200 expended in the fiscal year 1911 for maintenance in making a minor survey of the improved channel to determine the extent of deterioration.

The river and harbor act of February 27, 1911, made an appropriation of $10,000 for maintenance of Mystic and Malden Rivers, but the allotment of this appropriation to each work has not been made.

The projected channel was completed in November, 1906.

The maximum draft that can be carried, June 30, 1912, at mean low water is 6 feet up to the first turn above Denning's wharf, and thence to the head of navigation 4 feet. The mean range of tide is 9.8 feet.

The head of navigation is the upper limit of that part of the channel under improvement, at the stone bridge at Medford, to which point, 6 miles above its confluence with the Charles River in Boston Harbor, the stream is navigable in fact.

The commerce benefited by this improvement, chiefly coal, amounted in 1910 to 21,966 short tons, and in 1911 to 43,800 short tons, valued at $181,500. It is reported that barges of the lightest draft remaining in service deliver coal at Medford without the expense of lightering, which would be about 50 cents per ton.

(*b*) *Malden River.*—Malden River rises in Melrose, Mass.; flows for 4½ miles in a southerly direction and empties into Mystic River 3 miles above the mouth of the latter. The section included in the project is about 1.6 miles long from the confluence with the Mystic.

In its original condition the Malden had a practicable channel 4 feet deep at mean low water, extending only 2,000 feet above its confluence with the Mystic.

The original project, adopted by the act of August 2, 1882, was to make the channel 100 feet wide and 12 feet deep at mean high water to the Charles Street Bridge, about 1.8 miles above its confluence with the Mystic, at an estimated cost of $35,000.

The amount expended on the Malden River under the original project and prior to operations under the existing project was $10,000. A channel was secured with a least width of 50 feet and 70 feet at turns, with a depth of 12 feet at mean high water from the mouth to the Medford Street Bridge at Malden, a distance of 1.6 miles.

The project, adopted by the act of July 13, 1892, is to dredge a channel 12 feet deep at mean high water, 100 feet wide to the Medford Street Bridge, 1.6 miles above its confluence with the Mystic, and 75 feet wide about 1,200 feet farther to the Charles Street Bridge, at an estimated cost of $37,000.

The local officer has reported the river above the Medford Street Bridge to be unworthy of improvement by the United States, but no official action has as yet been taken thereon.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Malden River, 1880 [1]	Senate	[2] Ex. 29	Forty-sixth	Third	1881 [2]	522
Modifications, 1882, 1884 [1]					1900 [3]	1191
Malden River:						
1888					1889 [2]	594
1890 [3]					1891 [2]	672
1910-11	House	[4] 77	Sixty-second	First		

[1] Original project, Aug. 2, 1882.
[2] No maps.
[3] Existing project, July 13, 1892.
[4] Contains maps.

No work was done and none required during the past year in maintenance of the improvement.

The amount expended under this project to June 30, 1912, was $59,521.10 (including $44,534.71 for maintenance).

The river and harbor act of February 27, 1911, made an appropriation of $10,000 for maintenance of Mystic and Malden Rivers, but the allotment of this appropriation to each work has not been made.

A channel 100 feet wide and 12 feet deep at mean high water up to the Medford Street Bridge was completed in 1897, since which time it has been maintained by redredging.

The maximum draft that can be carried at mean high water, June 30, 1912, through the improved channel is 12 feet. The mean range of tide is 9.8 feet.

The head of navigation is at the Medford Street Bridge at Malden, to which point the stream is navigable in fact, 1.6 miles above its confluence with the Mystic River.

The commerce, chiefly coal, amounted in 1910 to 88,834 short tons, and in 1911 to 80,033 short tons valued at $330,161.90. The improvement is reported to enable the smallest barges, or larger barges with partial cargoes, to deliver coal at Malden, saving the cost of lightering—50 cents per ton.

The river and harbor act of July 25, 1912, adopted a new project in accordance with report printed in House Document No. 77, Sixty-second Congress, first session, which contemplates increasing the depth to 6 feet at mean low water (16 feet at mean high tide) by means of dredging, the material so dredged to be deposited behind dikes, on shore, at a cost not to exceed $80,000, and made an appropriation of this amount for completing the work.

July 1, 1911, balance unexpended	$478.90
July 1, 1912, balance unexpended	[1] 478.90
Amount appropriated by river and harbor act approved July 25, 1912	80,000.00
Amount available for fiscal year ending June 30, 1913	80,478.90

(*c*) *Mystic River below the mouth of Island End River.*—Island End River is 1.6 miles above the mouth of the Mystic at the navy yard in Charlestown, and 2,700 feet above the Chelsea drawbridge over the Mystic.

In its original condition the Mystic up to Island End River had a narrow channel 14.4 feet deep at mean low water, but so narrow above the drawbridge as to be barely practicable.

The original project, adopted by the act of March 3, 1899, with estimate of cost, printed in House Document No. 178, Fifty-fifth Congress, third session, was to dredge a channel 25 feet deep at mean low water and 300 feet wide, embracing 1.7 miles of the Mystic extending from its mouth to a point 800 feet above Island End River, at a cost estimated in August, 1899, at $267,547.50 (reduced estimate).

This project was modified by the river and harbor act of June 25, 1910, in accordance with plan printed in House Document No. 1086, Sixtieth Congress, second session, by providing for the abondonment of the proposed extension above the mouth of Island End River.

The 25-foot project, as modified, was completed in February, 1911. The total expenditures to June 30, 1912, were $136,005.12 (all for improvement, except $10,281.92 for maintenance).

The existing project, adopted by the river and harbor act of June 25, 1910 (H. Doc. No. 1086, 60th Cong., 2d sess.), provides for a channel 30 feet deep from the mouth of Island End River to Chelsea Bridge, and through the draw to the 35-foot channel on the downstream side of the bridge; the channel has a width of 600 feet at the upstream end, gradually narrowing to 300 feet, and includes the widening of the entrance channel leading to Mystic Wharf, at an estimated cost of $172,000. No modification has been made in existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to 800 feet above Island End River, 1899.[2]	House	[3] 178	Fifty-fifth	Third	1899 [3]	1096
Curtailed [2]	do	[4] 1086	Sixtieth	Second		
Mouth of Island End River to Chelsea bridge, 1908.[5]	do	[4] 1086	do	do		

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[1] See consolidated money statement on page 85. Allotment from appropriation of February 27, 1911 ($5,000), not yet made.

[2] Project of Mar. 3, 1899.

[3] No maps.

[4] Contains maps.

[5] Existing project, June 25, 1910.

No work was done during the fiscal year. The expenditure, all for improvement, was $5,403.84 for final payment on contract completed during the previous fiscal year and $431.87 for engineering expenses and advertising in connection with a new contract entered into for dredging along the western edge of the channel just above Chelsea Bridge to make a direct, straight connection (in conjunction with the dredging by the city of Boston through the draw spans of its new bridge) between the 35-foot channel below and the 30-foot channel above the bridge, already dredged by the United States.

Under the existing project to June 30, 1912, there was expended $63,830.92 (all for improvement). From sales, 45 cents was derived. The project is about 39 per cent completed.

A channel 300 feet wide and 30 feet deep has been dredged from Chelsea Bridge to just above the mouth of Island End River, except a section on the north side of the channel about 300 feet long and 35 feet wide just above the Chelsea Bridge pier, where ledge has been found above grade. The entrance to the channel leading to Mystic Wharf has also been enlarged by dredging to 30 feet depth.

The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality under improvement is at mean low water 30 feet. The mean range of tide is 9.6 feet.

The commerce of the river, which in 1901 amounted to 1,430.650 short tons, had increased to 3,715,805 short tons in 1908, and to 4,894,088 short tons in 1909. In 1910 the amount was 3,245,630 short tons, and, in 1911, 3,562,870 short tons, valued at more than $17,000,000.[1] About three-fourths of all the freight carried on the river is coal.

No material reduction in freight rates has been effected by the improvement, but it is of advantage to shipping interests in permitting utilization of larger vessels.

The appropriation recommended will be applied to completion of the project.

July 1, 1911, balance unexpended	$14,004.79
Receipts from sales	.45
	14,005.24
June 30, 1912, amount expended during fiscal year, for works of improvement	5,835.71
July 1, 1912, balance unexpended	8,169.53
Amount appropriated by river and harbor act approved July 25, 1912	50,000.00
Amount available for fiscal year ending June 30, 1913	58,169.53
July 1, 1912, amount covered by uncompleted contracts	4,112.50
Amount (estimated) required to be appropriated for completion of existing project	[2]50,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[2]50,000.00

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[1] The statistics prior to 1910 include south channel of Mystic River and the portion of Mystic Wharf lying below Chelsea Bridge. These localities are omitted from the 1910 and 1911 statistics as they are not influenced by this improvement.

[2] Exclusive of amount available for fiscal year 1913.

CONSOLIDATED.

July 1, 1911, balance unexpended	$24,483.69
Receipts from sales	.45
	24,484.14
June 30, 1912, amount expended during fiscal year, for works of improvement	5,835.71
July 1, 1912, balance unexpended	18,648.43
Amount appropriated by river and harbor act approved July 25, 1912	130,000.00
Amount available for fiscal year ending June 30, 1913	148,648.43
July 1, 1912, amount covered by uncompleted contracts	4,112.50
Amount (estimated) required to be appropriated for completion of existing project	[1] 50,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] [2] 50,000.00

(See Appendix B 8.)

9. Harbor at Boston, Mass.—The natural boundaries of Boston Harbor include all the expanse of tidewater lying within a line drawn from Point Allerton to Point Shirley, and extending from that line westward to the shores of the mainland. This comprises a surface area of about 30,000 acres, exclusive of the islands.

In its original condition the headlands and islands were without protection against the sea, which was extensively eroding them. Dangerous rocks obstructed the approach and entrance from Nantasket Roads to the lower main ship channel through the Narrows. That channel was 23 feet deep at mean low water, with a least width of 150 feet. The upper main ship channel from President Roads to Boston had a least depth of 18 feet at mean low water, with a least width of 100 feet. The channel from President Roads to Broad Sound in the ocean had a least depth of 29 feet at mean low water, with a least width of 200 feet.

The original project, adopted by the act of March 2, 1825, was "for the preservation of the islands in Boston Harbor, necessary to the security of that place," and until 1866 all expenditures, amounting to $546,526.10, appear to have been applied to that purpose in the building and repair of sea walls. The amount expended upon them since 1866 can not be accurately stated.

The project for the improvement of the harbor adopted by the act of March 2, 1867, was (as modified) to make the main ship channel from Nantasket Roads to Boston 23 feet deep at mean low water, 600 feet wide through the Narrows to President Roads, and 1,000 feet wide from President Roads to Boston.

To this project of improvement were added, from time to time, minor channels within or tributary to the harbor, since completed with allotments from the appropriation for Boston Harbor, known as Nantasket Beach Channel, Nix Mate Channel, Jeffries Point Channel, Chelsea Creek, Charles River, and Fort Point Channel.

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[1] Exclusive of amount available for fiscal year 1913.

[2] For Mystic River below mouth of Island End River.

Under the original project for sea walls and supplemental projects for the channels above named there has been expended for improvement and maintenance to June 30, 1912, $2,812,227.38, exclusive of all expenditures upon the three existing projects (27-foot, 30-foot, and 35-foot channels), with which expenditure about 3.75 miles of sea walls have been built and maintained, protecting the most exposed headlands and islands, the subordinate channels described in the preceding paragraph (except Charles River) have been completed, and a channel was obtained 23 feet deep at mean low water from Nantasket Roads to Boston, with a least width of 625 feet in the Narrows and 850 feet between President Roads and the city. From sales of property $265.46 has been derived.

The existing projects (other than for maintenance of the sea walls and the minor channels described above) are for improvement of the main channels, viz:

1. Adopted by the river and harbor act of July 13, 1892: To widen the main ship channel, from Nantasket Roads to Boston, 8½ miles, to 1,000 feet, and to deepen it to 27 feet at mean low water, at an estimated cost of $1,250,000, subsequently increased to $1,488,751. Project completed.

2. Adopted by the river and harbor act of March 3, 1899 (H. Doc. No. 133, 55th Cong., 2d sess.): To widen the Broad Sound Channel, 2 miles long from President Roads to the sea, to 1,200 feet, and to deepen it to 30 feet at mean low water, at an estimated cost of $455,000. Project completed.

3. Adopted by the river and harbor act of June 13, 1902 (H. Doc. No. 119, 56th Cong., 2d sess.): To provide channels 35 feet deep at mean low water, 1,200 feet wide from the navy yard at Charlestown and the Chelsea Bridge and Charles River Bridge to President Roads, 6 miles, and 1,500 feet wide from President Roads through Broad Sound to the ocean, 1½ miles, at an estimated cost of $7,994,000 in round numbers. This estimate differs from any made in the project quoted in the act as the basis of the appropriation, owing to the different widths of the channels adopted. (To avoid a large amount of rock excavation the 35-foot channel from President Roads to Broad Sound is in a different location from the 30-foot channel.) No modification has been made in any of the foregoing projects since their adoption.

The river and harbor act approved July 25, 1912, adopted a new project, as recommended in House Document No. 272, Sixty-second Congress, second session, for improvement of Chelsea Creek between the Meridian Street Bridge and the old East Boston Bridge, by providing a channel 150 feet wide and 25 feet deep at mean low water, at an estimated cost of $85,000; subject to the condition, however, that the 24-inch water main of the Metropolitan Water System, which crosses the stream about 800 feet above the Meridian Street Bridge, is lowered without expense to the United States. The act made an appropriation of $85,000 for this work.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Maps showing location of works of improvement:						
1875					1875 [1] (Pt. 2)	404
1880					1880 [1]	349
1883					1883 [1]	454
Map showing location of works of preservation and improvement made and proposed by United States, from 1825–1888, and of improvements by State Harbor and Land Commissioners 1866–1888					1888 [1]	455
Upper harbor and Narrows, 1892 (map).[2]					1894 [1]	554
Navy yard to entrance of main ship channel and from main ship channel in President Roads through Broad Sound, 1897.[3]	House	[1] 133	Fifty-fifth	Second	1898 [4]	886
Navy Yard and Chelsea Bridge and Charles River Bridge to President Roads and from President Roads through Broad Sound to the ocean, 1900.[5]	do	[1] 119	Fifty-sixth	do	1901 [4] 1908 [1]	1096 771
Headland in town of Hull, at entrance to Boston Harbor, 1882–3.	Senate	[1] Ex. 74	Forty-eighth	First	1884 [4]	553
East Boston channel, 1892, 1894	House do	[4] Ex. 55 [1] Ex. 58	Fifty-second Fifty-third	Second Third	1893 [4] 1895 [4]	798 649
Allerton Point, with view to construction seawall to protect navigation, 1905.	do	[4] 140	Fifty-ninth	First		
Winthrop Head, with view to construction of seawall to protect navigation, 1905.	do	[4] 144	do	do		
South Bay, 1910	do	[4] 272	Sixty-second	Second		
South channel of Mystic River, 1910	do	[4] 272	do	do		
Winthrop Beach, with view to construction sea wall, 1911.	do	[4] 258	do	do		

[1] Contains maps.
[2] 27-foot project, July 13, 1892.
[3] 30-foot project, March 3, 1899.
[4] No maps.
[5] 35-foot project, June 13, 1902.

SUMMARY OF OPERATIONS DURING THE FISCAL YEAR ENDING JUNE 30, 1912.

General improvement.—For extending riprap protection in front of sea wall at Long Island Head, and repairing riprap beach protection at Lovells Island, and the sea walls at Rainsford, Deer, Gallops, and Castle Islands, and at Point Allerton; placing a tide gauge mounted on a dolphin off Spectacle Island; applying funds toward removal of a shoal at the old dump ground in Broad Sound; and for miscellaneous expenses of surveys and superintendence; $39,580.14 ($882.96 for improvement and $38,697.18 for maintenance) was expended.

Twenty-seven-foot channel.—A survey was made to determine the condition of the improved channel, at an expenditure of $1,168 for maintenance.

Thirty-foot channel.—A minor survey to determine the condition of the dredged channel was made, and $68,734.03 was applied toward the removal of a shoal at the old dump ground in Broad Sound. Total expenditure, $69,800, all for maintenance.

Thirty-five-foot channel.—All the dredging embraced in the project was completed and work commenced on removal of all ledges obstructing the dredged channel, except Finns Ledge in Broad Sound, a survey of which was in progress. Expenditure, $339,238.16, all for improvement.

Finns Ledge.—In the river and harbor act approved July 25, 1912, provision was made for an examination and survey to provide a deeper channel from President Roads to the ocean. The Finns Ledge survey, as partly completed, indicates that any such deeper channel must be located to the eastward of that ledge, as its area below the 35 feet projected in the existing project is too great to allow its removal to 40 feet for any reasonable sum. Without blasting, Finns Ledge would afford an excellent foundation for a lighthouse, which, with the Graves Lighthouse, would make the Boston entrance one of the best marked on the Atlantic coast. This possible modification of project will be discussed in detail in the report on the preliminary examination and survey called for by the act approved July 25, 1912.

Under the project of July 13, 1892, for 27-foot channel, the amount expended to June 30, 1912, was $1,474,106.29, of which $59,715.30 was for maintenance ($10 was derived from sales).

Under the project of March 3, 1899, for 30-foot channel, to June 30, 1912, the amount expended was $455,000; $385,200 for improvement, and $69,800 for maintenance.

To June 30, 1912, the amount expended on the 35-foot channel, not including outstanding liabilities, was $6,252,531.04 ($122.71 was derived from sales), all for improvement.

With the total amount expended under the 27-foot project the upper and lower main ship channels from Boston to President Roads and from President Roads to the sea have been dredged to the width of 1,000 feet and depth of 27 feet at mean low water.

A survey of the improved channel in 1911 shows that no material deterioration has occurred. The maximum draft that can be carried at mean low water, June 30, 1912, over the shoalest part is 27 feet.

Under the 30-foot project, a channel has been obtained 1,200 feet wide and 30 feet deep at mean low water from President Roads to Broad Sound.

A survey of the improved channel in 1911 shows that no material deterioration has occurred. The maximum draft that can be carried at mean low water, June 30, 1912, over the shoalest part is 30 feet.

Under the 35-foot project of June 13, 1902, a channel of the full projected depth and width from the navy yard, Charles River Bridge, and Chelsea Bridge to President Roads, and from President Roads through Broad Sound to the ocean has been dredged. but the channel is still obstructed by ledges.

The work accomplished to the end of the fiscal year in the upper main ship channel was the dredging of 16,647,702.5 cubic yards of mud, sand, gravel, and clay, 23.642 cubic yards of bowlders, and the excavation of 30,397 cubic yards of ledge; and in Broad Sound Channel the dredging of 4,727,102 cubic yards of mud, sand, gravel, clay, hardpan, and cobblestones, and 349.993 cubic yards of bowlders. The total amount of material dredged is 21,375,178.135 cubic yards, and of rock excavated is 30,397 cubic yards, which completes all the dredging and 25 per cent of all the rock excavation required under the project. The yardage expressed refers to scow measurement except for rock excavation, which is place measurement.

The mean range of tide is 9.5 feet at Boston Light and 9.6 feet in the upper harbor.

The foreign exports and imports for the port of Boston during the calendar year ending December 31, 1911, amounted in value to $189,575,378, being an increase of $122,888,857 over the valuation in 1867, when the systematic improvement of the channels was begun.

As to the effect of the improvement on freight rates, the general manager of the principal foreign steamship lines entering this port states that about 30 years ago steamers were employed with a loaded draft of 20 feet to 24 feet; 22 or 23 years ago, of 25 to 26 feet; 14 years ago, 27 or 28 feet; 10 years ago, 28 feet 9 inches; later, 31 feet; and recently one of 33 feet 10½ inches. He states, generally—

> that freight rates, caused by the larger class of steamers being used, are about 50 per cent less than they were some 15 or 20 years ago, when very much smaller steamers were engaged in the trade.

The appropriation recommended for general improvement will be applied to necessary repairs to sea walls and maintenance of improvements heretofore made in the tributary channels of the harbor.

Fort Point Channel.—This channel is situated between the eastern shore of Boston proper on the one side and the reclaimed and improved South Boston flats on the other side; is about 1¼ miles in length and connects the tidal basin of the South Bay, which covers an area of about 250 acres, with Boston upper harbor. In its original condition the mid-channel depth was 12 feet at its mouth and 16 feet thence to the Federal Street Bridge, excepting at the draw in the Congress Street Bridge, where it was 14.5 feet at mean low water.

The original project, adopted by the act of August 5, 1886 (H. Ex. Doc. No. 206, 48th Cong., 2d sess.), which is also the existing project, is to dredge a channel 175 feet wide and 23 feet deep at mean low water from the entrance about 4,190 feet to near Federal Street Bridge, at an estimated cost of $100,000, reduced in 1887 to $78,750. No modification has been made in the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Fort Point Channel and the channel leading to wharves of New York and New England R. R., 1882-83.	Senate	[1] Ex. 74	Forty-eighth	First	1884 [1]	586
Fort Point Channel, 1884 [2]	House	[1] Ex. 206	do	Second	1885 [1]	548

[1] No maps.

[2] Project of Aug. 5, 1886.

No work was done and none required in maintenance of improvement during the fiscal year.

The total cost to the United States to June 30, 1912, was $75,606.23, including $9,219.10 for maintenance.

The improvement was completed in 1909.

The maximum draft that can be carried June 30, 1912, at mean low water over the shoalest part of the improved channel is 23 feet. The mean range of tide is 9.6 feet.

The head of navigation is the southern extremity of South Bay, at Massachusetts Avenue, Boston, Mass., to which point, about 2 miles from the entrance to the channel in Boston Harbor, the channel is navigable in fact.

The commerce benefited by this improvement consists of coal, sugar, building materials, and miscellaneous merchandise, which amounted in the calendar year 1910 to 1,423,456 short tons, and in 1911 to 1,507,621 short tons, valued at over $16,000,000.

PROJECT FOR GENERAL IMPROVEMENT.

July 1, 1911, balance unexpended		$48,349.51
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$882.96	
For maintenance of improvement	38,697.18	
		39,580.14
July 1, 1912, balance unexpended		8,769.37
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 25,000.00

PROJECT OF 1892 FOR 27-FOOT CHANNEL.

July 1, 1911, balance unexpended	$32,668.00
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,168.00
July 1, 1912, balance unexpended	31,500.00

PROJECT OF 1899 FOR 30-FOOT CHANNEL THROUGH BROAD SOUND.

July 1, 1911, balance unexpended	$69,800.00
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	69,800.00

CHELSEA CREEK (BOSTON HARBOR) PROJECT.

Amount appropriated by river and harbor act approved July 25, 1912	$85,000.00
Amount available for fiscal year 1913	85,000.00

PROJECT OF 1902 FOR 35-FOOT CHANNEL.

July 1, 1911, balance unexpended	$1,186,783.31
Receipts from sales	46.52
	1,186,829.83
June 30, 1912, amount expended during fiscal year, for works of improvement	339,238.16

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[1] Exclusive of the balance unexpended July 1, 1912.

July 1, 1912, balance unexpended	$847,591.67
July 1, 1912, outstanding liabilities	20,000.00
July 1, 1912, balance available	827,591.67
Amount appropriated by sundry civil act approved Aug. 24, 1912	25,000.00
Amount available for fiscal year ending June 30, 1913	852,591.67
July 1, 1912, amount covered by uncompleted contracts	801,222.90
Amount of continuing contract authorization, act of Mar. 2, 1907	3,894,000.00
Amount appropriated under such authorization	3,025,000.00
Amount yet to be appropriated	869,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 869,000.00

(See Appendix B 9.)

10. Dorchester Bay and Neponset River, Mass.—Dorchester Bay is at the mouth of Neponset River, in Boston Harbor.

Neponset River rises in Foxboro, Mass., and flows in a general northeasterly direction about 25 miles, emptying into Dorchester Bay. The section of the river included in the project extends from the mouth in the bay, upstream 1½ miles.

Prior to the adoption of the existing project the controlling depth, at mean low water in the bay up to Commercial Point, at the mouth of the river, was 13 feet; thence up the river to the highway bridge at Neponset, 1½ miles above its mouth, it was 8 feet, and from said bridge up to Milton Mills, 4 miles above its mouth and at the head of navigation, it was 3½ feet.

The original project, which is also the existing project, adopted by the act of March 2, 1907 (H. Doc. No. 83, 59th Cong., 2d sess.), is to obtain, by dredging, a channel 175 feet wide and 18 feet deep at mean low water through Dorchester Bay and the mouth of the river to Commercial Point, 2.9 miles, and 100 feet wide and 15 feet deep at mean low water in Neponset River from Commercial Point to the Neponset highway bridge; estimated to cost $125,233.34.

No modification has been made in the existing project since its adoption.

The entire sum was appropriated by the act of March 2, 1907, with the proviso (printed on p. 77 of the Annual Report of the Chief of Engineers for 1910) that a channel 6 feet deep from Neponset highway bridge to Milton Mills, 100 feet wide between the said bridge and the Granite bridge, 1.15 miles, 75 feet wide thence to Godfrey's wharf, 1.25 miles, and thence 50 feet wide for a farther distance of 250 feet, should be made and hereafter maintained by the State of Massachusetts or other agency.

Assurance that the improvement above the Neponset highway bridge would be maintained by the State was given by resolves of the Massachusetts Legislature, approved June 24, 1907, and March 5, 1908. The State improvement (above Neponset highway bridge) was completed in August, 1910.

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[1] Exclusive of amount available for fiscal year 1913.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Neponset River:						
1892	House	[1] Ex. 35	Fifty-second	Second	1893 [1]	800
1895	Senate	[1] Ex. 44	Fifty-third	Third		
1897	House	[2] Ex. 36	Fifty-fifth	First	1897 [1]	875
Dorchester Bay and Neponset River, 1905.[3]	House	[2] 83	Fifty-ninth	Second		

[1] No maps. [2] Contains maps. [3] Existing project, Mar. 2, 1907.

No work was done and none required during the fiscal year in maintenance of the improvement.

The amount expended to June 30, 1912, was $94,584.55, all for improvement. The project was completed on December 28, 1909.

The maximum draft that can be carried June 30, 1912, over the shoalest part of the improvement is 18 feet at mean low water from Dorchester Bay and the mouth of the river to Commercial Point, and 15 feet thence to Neponset highway bridge.

The mean range of tide is 9.6 feet.

The head of navigation is at Milton Mills, to which point, 4 miles above the mouth of the river, the stream is navigable in fact.

During the calendar year 1908 the total commerce of the bay and river was 337,397 short tons; in 1909, 251,667 short tons; in 1910, 245,904 short tons; and in 1911, 256,039 short tons (valued at $1,520,213.30), of which 56,270 tons was carried to Milton above the limits of the improvement undertaken by the United States.

The improvement has resulted in no material reduction in freight rates, but is of advantage to shipping interests in permitting the utilization of larger vessels.

July 1, 1911, balance unexpended	$30,648.45
July 1, 1912, balance unexpended	30,648.45

(See Appendix B 10.)

11. Weymouth River, Mass.—(a) Weymouth Fore River.—This river rises in Braintree, Mass., and flows in a northerly direction 7½ miles, emptying into Hingham Bay, Boston Harbor. The section included in the project commences at the mouth and embraces a length of 3½ miles.

In its original condition the channel had a depth of 18 feet at mean low water with a least width of 300 feet up to a point about 1 mile below Weymouth Fore River bridge at Quincy Point, the 18-foot channel extending 3,400 feet above that point, but too tortuous for safe navigation of large vessels. In the remaining 1,800 feet to the bridge the channel when surveyed was 150 feet wide and 13 feet deep at mean low water, but, before the adoption of the project, had been increased without expense to the United States to the width of 200 feet and depth of 15 feet at mean low water. Above the bridge the channel was 12 feet deep at mean low water for a distance of 2,200 feet; 6 feet deep with a practicable width a distance of 4,000 feet farther; and 3 feet deep a distance of 7,000 feet farther, but the channel was too narrow to be practicable.

The original project, adopted by the act of September 19, 1890, was to obtain in Weymouth Fore River for a distance of 7,000 feet below the head of navigation a channel with the uniform depth of 6 feet at mean low water with the width of 100 feet to near Weymouth Landing, 80 feet thence to Braintree Bridge, and 50 feet thence 950 feet above that bridge, at an estimated cost of $40,000. The amount expended under that project was $42,750 (including $2,750 for maintenance), with which, except for four small ledges uncovered by dredging, there was dredged and maintained to 1906 a channel of the full projected dimensions, the future maintenance of which devolves upon the State of Massachusetts under acts of Congress and the Legislature of Massachusetts, printed on pages 824 and 825 of the Annual Report of the Chief of Engineers for 1905.

The project adopted by the act of March 3, 1905, embraced that portion of the river extending from its mouth in Hingham Bay about 3½ miles up to Weymouth Fore River bridge at Quincy Point, and was to dredge a channel about 1 mile long, 300 feet wide, and 18 feet deep up to that bridge, at an estimated cost of $57,500.

The amount expended on this project was $55,000, all for improvement, with which the authorized channel was completed in June, 1907.

The existing project, adopted by the river and harbor act of February 27, 1911 (H. Doc. 1334, 61st Cong., 3d sess.), is to widen and straighten by dredging and ledge removal the existing channel below Weymouth Fore River bridge, including the removal of Channel Rock, all at an estimated cost of $140,000. No modification has been made in the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Weymouth Fore River above Fore River Bridge, 1889.[1]	House	[2] Ex. 26	Fifty-first	First	1890 [2]	521
Weymouth Fore River below Fore River Bridge, 1902–3.[4]	do	[2] Ex. 36	Fifty-eighth	Second	1904 [2]	891
Weymouth Fore River below Fore River Bridge, 1910.[5]	do	[3] 1334	Sixty-first	Third		

[1] Original project, Sept. 19, 1890.
[2] Contains maps.
[3] No maps.
[4] Project of Mar. 3, 1905.
[5] Existing project, Feb. 27, 1911.

During the fiscal year, with an expenditure of $33,052.17, all for improvement, 268,451 cubic yards of sand and gravel and one bowlder, measuring 2.889 cubic yards, were dredged; and under the contract for rock removal on which work was commenced December 22, 1911, with a rock chisel, 2,571 holes have been drilled 3 feet below grade and 448 holes partially drilled, over about 75 per cent of the area included in the project, and a small quantity of the broken material has been removed. The amount expended on the existing project to June 30, 1912, was $33,450.50. To June 30, 1912, 97 per cent of the estimated amount of dredging has been completed and 60 per cent of the ledge work.

The maximum draft that can be carried through the portion of the river embraced in this improvement is 18 feet at mean low water. The mean range of tide is 9.5 feet.

The head of navigation is 2.7 miles above this improvement at East Braintree, to which latter point the navigable length of Weymouth River from its mouth is 6.2 miles.

The freight carried on the river amounted in 1908 to 173,649 short tons, in 1909 to 159,342 short tons, in 1910 to 186,303 short tons, and in 1911 to 173,445 short tons (valued at $888,665.59), of which the greater part was coal. The increased depth obtained is of importance chiefly to the Fore River Ship Building Co., which builds at its extensive plant at Quincy Point large passenger and freight steamers, cruisers, and battleships up to 30,000 tons. This company states that while no direct reduction in freight rates has been realized, the improved channel has proven of greater value and benefit in permitting the entrance of larger barges loaded with coal and lumber and the passage of vessels of greater draft between the harbor and the shipyards on the river.

July 1, 1911, balance unexpended	$142,101.67
June 30, 1912, amount expended during fiscal year, for works of improvement	33,052.17
July 1, 1912, balance unexpended	109,049.50
July 1, 1912, outstanding liabilities	8,737.04
July 1, 1912, balance available	100,312.46
July 1, 1912, amount covered by uncompleted contracts	30,701.80

(*b*) *Weymouth Back River.*—Weymouth Back River rises in East Weymouth, Mass., and flows in a general northerly direction 4½ miles, emptying into Weymouth Fore River. The section included in the project commences one-fourth of a mile above the mouth and extends upstream about 1 mile.

In its original condition Weymouth Back River had a practicable channel not less than 200 feet wide and not less than 12 feet deep at mean low water from its confluence with Weymouth Fore River, 8,000 feet to the wharf of the American Agricultural Chemical Co., except on a bar, 400 feet across, one-fourth of a mile above its mouth, where the depth was 11 feet, and except the 2,000 feet next below that wharf, where the depth gradually shoaled from 12 feet to 6 feet at mean low water.

The original project, adopted by a proviso in the act of August 18, 1894 (H. Ex. Doc. No. 256, 51st Cong., 2d sess.), which is also the existing project, is to dredge in Weymouth Back River a channel 12 feet deep at mean low water, 200 feet wide through the bar, and to extend the channel, 12 feet deep at mean low water and 200 feet wide, 2,200 feet, to the wharf of the American Agricultural Chemical Co., at an estimated cost of $22,000. No modification has been made in the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Weymouth Back River, 1890 [1]	House	[2] Ex. 256	Fifty-first	Second	1891 [3]	682
Weymouth Back River, Hingham Bridge to Manns Wharf, 1896.	do	[2] 12	Fifty-fifth	First	1897 [3]	878

[1] Existing project, Aug. 18, 1894. [2] Contains maps. [3] No maps.

The bids received in 1911 for redredging the channel having been rejected, the work was readvertised in the fiscal year 1912 and contract entered into. Ten thousand and thirty cubic yards was removed, restoring the channel to the projected depth of 12 feet at mean low water, with a width of 200 feet through the bar at the mouth of the river, and with the same width (increased to 250 feet at the bends) to the wharf of the American Agricultural Chemical Co. Expenditure, $3,785.28, all for maintenance.

The amount expended on this project to June 30, 1912, was $26,000 (including $5,521.32 for maintenance). Fifteen cents was derived from sales.

In 1897, a channel at least 12 feet deep at mean low water was completed 200 feet wide through the bar near the mouth of the river and 125 feet wide thence to the chemical company's wharf. Nothing further was done under the project until 1908, when the remaining 75 feet to make the channel 200 feet wide was dredged; the channel through the bar was redredged to 12 feet depth, 175 feet wide, and dredging was done in the 125-foot channel dredged in 1897. Owing to lack of funds the restoration of this channel to the dimensions dredged in 1897 was not accomplished and the width of channel then available from the bar to the head of the improvement was but 180 feet. Subsequently the channel further deteriorated, but in 1912 it was restored to the full projected dimensions.

The maximum draft that can be carried at mean low water over the shoalest part of the locality under improvement is 12 feet. The mean range of tide is 9.4 feet.

The head of navigation is about 4 miles above the bar at the mouth of the river and about 3 miles above the wharf of the chemical company, which is the upper limit of the improvement.

The commerce benefited by the improvement comprised, in 1909, 180,009 short tons; in 1910, 181,104 short tons, and in 1911, 204,625 short tons, valued at $4,580,191, of which about 90 per cent was raw and manufactured fertilizer products.

No data are available as to the effect on freight rates. The tonnage is carried almost exclusively in vessels owned and operated by the American Agricultural Chemical Co.

July 1, 1911, balance unexpended		$4,785.28
Receipts from sales		.15
		4,785.43
June 30, 1912, amount expended during fiscal year, for maintenance of improvement		3,785.28
July 1, 1912, balance unexpended		1,000.15

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July 1, 1911, balance unexpended		146,886.95
Receipts from sales		.15
		146,887.10
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$33,052.17	
For maintenance of improvement	3,785.28	
		36,837.45
July 1, 1912, balance unexpended		110,049.65
July 1, 1912, outstanding liabilities		8,737.04
July 1, 1912, balance available		101,312.61
July 1, 1912, amount covered by uncompleted contracts		30,701.80

(See Appendix B 11.)

12. Hingham Harbor, Mass.—On the south side of Boston Harbor, and distant from the wharves of Boston about 14 miles in a southeasterly direction. It has an area of about 1 square mile, with extensive mud flats, laid bare at low water.

In its original condition the channel leading to Hingham, south of Ragged and Sailor Islands, was very narrow and crooked and obstructed by sunken rocks and shoals over which the least depth was 4 feet at mean low water, while the available width of channel was but 30 feet.

The original project, adopted by the act of March 3, 1875, was to widen and deepen the natural channel by dredging and blasting to the width of 100 feet and depth of 8 feet at mean low water from deep water near the head of the harbor up to the vicinity of Hingham wharves, a distance of about 2,500 feet, at an estimated cost of $11,000. In 1876 a channel 100 feet wide and 8 feet deep at mean low water was completed a distance of 2,500 feet to the steamboat wharf, whence it was extended for about 500 feet, with a width of 50 feet and depth of 8 feet, at a total cost of $9,116.58; in 1884 3 cubic yards of ledge was removed from the channel at a cost of $200, making the total cost to that date $9,316.58, all for improvement, allotted from the appropriation for improving harbor at Boston, Mass.

The existing project, adopted by the act of August 5, 1886 (H. Ex. Doc. No. 137, 48th Cong., 2d sess.), and completed in 1893, is to deepen the improved channel, 2,500 feet long, 100 feet wide, to 10 feet at mean low water and remove a mid-channel ledge in the lower channel between Chandlers and Ragged Islands, at an estimated cost of $18,750. By the act of March 2, 1907, without previous estimate, $10,000 was appropriated for redredging the channel. By the river and harbor act of March 3, 1909, the unexpended balance of this appropriation was "made available for redredging and improving the channel."

No modification has been made in the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Hingham Harbor:						
1874 [1]	House	[3] Ex. 75	Forty-third	Second	1875 [2] (Pt.2)	417
Map, 1888					1888 [3]	456
1884 [4]	House	[3] Ex. 137	Forty-eighth	Second	1885 [2]	558
1909 (use of available funds) [4]	do	[3] 355	Sixty-first	do		

[1] Original project, Mar. 3, 1875.

[2] No maps.

[3] Contains maps.

[4] Existing project, Aug. 5, 1886.

No work was done during the fiscal year.

To June 30, 1912, $29,000 (including $10,000 for maintenance) has been expended under the existing project.

The existing project was completed in 1893.

In 1911 the channel was redredged to the width of 100 feet and depth of 8 feet at mean low water from deep water near the head of the harbor to the steamboat wharf, a distance of about 2,000 feet, and was also redredged for a further distance of about 500 feet, 50 feet wide and 6 feet deep at mean low water.

The maximum draft that can be carried June 30, 1912, at mean low water over the shoalest part of the locality under improvement is 8 feet to the steamboat wharf and 6 feet for about 500 feet farther. The mean range of tide is 9.5 feet.

The State of Massachusetts dredged during 1911 an anchorage basin to the depth of 6 feet at mean low water, and a channel 75 feet wide and 6 feet deep at mean low water to connect this anchorage basin with the channel dredged by the United States, and widened to 75 feet that portion of the channel which was dredged by the United States to a width of 50 feet.

The commerce benefited by the improvement, consisting of coal and building materials, is diminishing, 12,370 short tons having been received in calendar year 1908, 11,086 short tons in 1909, 9,197 short tons in 1910, and 9,443 short tons in 1911, valued at $84,742.80. The line of Boston passenger steamers which at the time the improvement was made landed at the pier at the head of the improved channel has long since been discontinued.

The improvement has effected no reduction in freight rates.

(See Appendix B 12.)

13. Harbors of Plymouth and Provincetown, Mass.—(*a*) *Harbor at Plymouth.*—Plymouth Harbor is situated 45 miles by water south of Boston. Its outer anchorage, the "Cow Yard," is common to Plymouth, Duxbury, and Kingston. The harbor contains 2,000 acres, almost all of which, except the channels, is dry at low tide.

In the original condition of the harbor the channel and low-water line were about 2,500 feet from the wharf at Plymouth. Long Beach, between the harbor and the ocean, was, for the most part, low and narrow, and liable to inroads by the sea that would injure or destroy the harbor.

All projects and expenditures prior to 1875 appear to have been for the construction of works for the preservation of the beach.

The original project for the improvement of the channel, adopted by the act of March 3, 1875, was to dredge a channel about one-half mile long, 100 feet wide, and 6 feet deep at mean low water, through the flats from the channel in the inner harbor to Long Wharf in Plymouth, at an estimated cost of $28,000.

Prior to operations under the existing project, $198,859.22 had been expended in preserving Long Beach and in dredging under the project of March 3, 1875, as modified, which resulted in obtaining a channel about one-half mile long, 150 feet wide, and 9 feet deep; and a basin directly in front of the town wharves 866 feet long, 150 feet wide, and 9 feet deep. Of this amount $60,727.52 was expended for maintenance.

The existing project for the protection of the beach, adopted by the act of March 3, 1899 (printed in the Annual Report of the Chief of Engineers for 1899, p. 1089) is to strengthen the sections of beach damaged by the great storm of November, 1898, and to restore Eel River to its former course, discharging into the head of the harbor, from its course into the sea to which it was changed by the storm. The estimated cost was $95,709.

No modification has been made in the existing project since its adoption.

In the report of January 20, 1899, submitting the project with estimate of cost, it was said:

> The following estimate for this work should be considered approximate only. for the reason that further changes are likely to occur before the work can be accomplished, which changes may materially increase or diminish the amount of work necessary to restore the beach to a safe condition.

The accretion of the beach before the stone dike was built materially diminished the cross section of a considerable part of it and permitted its extension to protect other places where further erosion has occurred.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Report upon protection and improvement of Plymouth Harbor, 1869.	House	[1] Ex. 18	Forty-first	Second		
Plymouth Harbor, 1874 (for dredging).[2]	do	[1] Ex. 161	Forty-third	First	1874 [1] (Pt. 2)	348
Map showing works completed and projected up to 1881.					1881 [3]	528
Map of dredged channel and basin, 1888.					1888 [3]	460
Plymouth Harbor, report on condition of beach and work necessary for protection, 1899.[4]	House	[1] 230	Fifty-sixth	First	1899 [1]	1089

[1] No maps.

[2] Original project, Mar. 3, 1875.

[3] Contains maps.

[4] Existing project, Mar. 3, 1899.

References to examination or survey reports and maps or plans not in project documents—Continued.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Goose Point to wharf of Plymouth Cordage Co., 1884.	House	[1] Ex. 71	Forty-eighth	Second	1886 [1]	588
Goose Point Channel, to public wharf at Kingston, 1888.					1889 [1]	596
Gurnet Rock and other rocks at mouth of harbor, 1897.	House	[1] 814	Fifty-fourth	Second	1897 [1]	868
Plymouth Harbor, with view to removal "Splitting Knife" and "Middle Ground" and north and south sides excavated channel, 1894, 1897.	do	Ex. 50 [2] 89	Fifty-third Fifty-fifth	Third First	1896 [1] 1897 [1]	645 877
Rubblestone breakwater from Long Beach along crest of Browns Island, 1907, 1908.	do	[2] 1168	Sixtieth	Second		
Plymouth Harbor, dredging, 1910-11.[3]						

[1] No maps. [2] Contains maps. [3] Not yet printed.

During the year 1,301 linear feet of the riprap dike (in two sections) extending along the seaward face of Long Beach were repaired at an expenditure of $11,490.64, all for maintenance.

The amount expended on the existing project to June 30, 1912, was $100,176.28, including $18,800 for maintenance.

In addition to the aforesaid amount expended under the present project, $3,954.42 has been expended for maintenance in redredging the turning basin, which had been dredged at the wharves under the project of March 3, 1875.

By way of refundment, $4,530.12 was collected in 1906 as damages from the surety of a failing contractor.

Under the existing project 12,459 linear feet of rubblestone dike have been built on Long Beach, which has resulted in strengthening the beach by the accretion of a large volume of sand and beach shingle; Eel River has been restored to its former course; 536 feet of stone dike have been built to prevent the river from being again turned into the sea; and 3,434 feet of the riprap dike (in two sections) extending along the seaward face of Long Beach have been repaired.

The town of Plymouth at its own expense has restored and deepened to 10 feet at mean low water the channel and basin completed by the Government.

The maximum draft that can be carried, June 30, 1912, at mean low water, over the shoalest part of the locality under improvement is 10 feet.

The mean range of tide is 10.1 feet.

The commerce consists chiefly of coal and lumber, of which 39,860 short tons were received in 1908, 37,840 in 1909, 39,848 in 1910, and 48,657 in 1911, valued at about $250,000.

It is reported by the harbor master at Plymouth that the improvement of this locality by the United States has effected a saving of 50 cents per ton in freight rates.

July 1, 1911, balance unexpended	$22,522.58
Balance returned to the emergency appropriation	700.00
	21,822.58
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	11,490.64
July 1, 1912, balance unexpended	10,331.94
Amount (estimated) required to be appropriated for completion of existing project	[1] 20,700.00

(*b*) *Harbor at Provincetown, Mass.*—This is an important harbor of refuge in the bight at the extremity of Cape Cod, about 40 miles southeast from Boston Light at the entrance to Boston Harbor.

In its original condition the width and depth of its entrance and the depth of its anchorage area, about 4,000 acres at the 18-foot contour lying within an east and west line through Wood End, were ample for the largest vessels, but actual or threatened inroads by the sea across the low and narrow part of the cape east of the town, and at intervals along about 1½ miles of the narrow beach southwest of the town, were a serious menace to the harbor.

The original project, adopted by the act of May 20, 1826, was "for the preservation of the point of land forming Provincetown Harbor."

The project from 1826 continuously to this date has been, by building dikes and groins and by other sand-catching devices, to arrest the erosion and promote the accretion of the barrier of beach and sand dunes which protects and preserves the harbor.

No modification has been made in the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Description and plan of works, Provincetown Harbor.					1876 [2]	161
Do					1879 [2]	278
Do					1886 [2]	574
For protection most slender part of beach, 1896.	House	[3] 8	Fifty-fifth	First	1897 [2]	878
Protection of harbor by dike, 1910.	do	[3] 821	Sixty-first	Second		

During the fiscal year 32,145 tons of stone were deposited in the dike across House Point Island flats at an expenditure of $42,303.55, all for new work.

The amount expended to June 30, 1912, was $261,896.56, all applied to improvement.

The preservation of the harbor, whose importance as a harbor of refuge requires no elaboration, depends upon the maintenance of the barrier from Abel Hill to Long Point as a protection against westerly and southwesterly seas. Since the commencement of the improvement it has been sought to maintain this barrier by means of timber structures of temporary character, designed to catch and hold the sand moved by the sea and wind. Although in the vicinity of and below Wood End they have been partially successful in accumulating sand moved by the wind, for the greater part of the distance between Abel Hill and Wood End they have failed in the long run to accomplish their purpose, and now for a considerable part of this distance there exists between the ocean and the harbor only a light, sand-filled, wooden bulkhead, built on the beach whose crest is below the level of spring tides. The failure of these works may be attributed to absence of any great quantity of wind-driven sand, and to the inability of light timber structures to withstand the inroads of the sea.

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[1] Exclusive of the balance unexpended July 1, 1912.
[2] Contains maps.
[3] No maps.

A rubblestone dike is about 61 per cent completed across House Point Island flats from the vicinity of Stevens Point to a point northeasterly from Wood End Light.

The extension of the beach protection at Long Point, contemplated in the river and harbor act of June 25, 1910, is not considered necessary at the present time.

The maximum draft that can be carried to the anchorage is ample for the largest vessels.

The commerce of this port is a small factor in this improvement compared with the preservation of this very excellent and important harbor of refuge.

July 1. 1911, balance unexpended	$142, 569. 96
June 30, 1912, amount expended during fiscal year, for works of improvement	42, 303. 55
July 1, 1912, balance unexpended	100, 266. 41
July 1, 1912, outstanding liabilities	11, 652. 42
July 1, 1912, balance available	88, 613. 99
July 1, 1912, amount covered by uncompleted contract	34, 043. 80

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July 1, 1911, balance unexpended		165, 092. 54
Balance returned to the emergency appropriation		700. 00
		164, 392. 54
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$42, 303. 55	
For maintenance of improvement	11, 490. 64	
		53, 794. 19
July 1, 1912, balance unexpended		110, 598. 35
July 1, 1912, outstanding liabilities		11, 652. 42
July 1, 1912, balance available		98, 945. 93
July 1, 1912, amount covered by uncompleted contracts		34, 043. 80
Amount (estimated) required to be appropriated for completion of existing project		[1]20, 700. 00

(See Appendix B 13).

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[1] Exclusive of the balance unexpended July 1, 1912.

14. Removing sunken vessels or craft obstructing or endangering navigation.—(*a*) *Wreck of schooner Davis Palmer, Broad Sound, Boston Harbor, Mass.*—This five-masted schooner with a cargo of coal was sunk December 26, 1909. Work on the removal of this vessel (begun in the previous fiscal year) was continued until October, 1911, when it was suspended because it is impracticable to work at this exposed locality except during the summer. At the date of this report work has not been resumed. Expenditure, $434.59 during fiscal year, for inspection.

(*b*) *Wreck of schooner Howard A. Hunt, in Plymouth Harbor, Mass.*—This was an abandoned vessel which drifted out of a dock at Plymouth to a position where it had become an obstruction to navigation. Its removal, under formal contract dated February 5, 1912, was completed on March 29, 1912, at a total cost of $500.

(*c*) *Wreck of schooner-yacht Sceneby, in Dorchester Bay, Boston Harbor, Mass.*—On January 10, 1912, it was reported that this vessel was sunk in the general channel in Dorchester Bay. Its removal under written proposal and written acceptance was accomplished on May 2, 1912, at a cost of $150.

(See Appendix B 14.)

EXAMINATIONS AND SURVEY MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports dated October 27, 1910, on preliminary examination of *south channel of Mystic River;* November 7, 1910, on preliminary examination of *South Bay, with a view to securing increased depth;* November 7, 1910, and June 12, 1911, on preliminary examination and survey, respectively, of *Chelsea Creek between the Meridian Street Bridge and the old East Boston Bridge*, required by the river and harbor act approved June 25, 1910, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 272, Sixty-second Congress, second session. Neither of the two first-mentioned localities is considered worthy of improvement at the present time by the General Government. A plan of improvement of Chelsea Creek between Meridian Street Bridge and the old East Boston Bridge, at an estimated cost of $85,000 for first construction, is presented.

The local officer was also charged with the duty of making a preliminary examination and survey provided for by the river and harbor act approved June 25, 1910, of *Plymouth Harbor, Mass.*, and reports thereon will be duly submitted when received.

EXAMINATION MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Report dated July 31, 1911, on preliminary examination of *Boston Harbor, Mass., with a view to the construction of a sea wall along*

Winthrop Beach, required by the river and harbor act approved February 27, 1911, was duly submitted by the district officer. It was reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and was transmitted to Congress and printed in House Document No. 258, Sixty-second Congress, second session. The improvement of this locality in the manner apparently desired is not deemed advisable at the present time.

The local officer was also charged with the duty of making a preliminary examination and survey of *Cohasset Harbor, Mass.*, with a view to the construction of a channel 150 feet in width and 8 feet in depth, required by the river and harbor act approved February 27, 1911, and reports thereon will be duly submitted when received.

IMPROVEMENT OF RIVERS AND HARBORS IN THE NEWPORT, R. I., DISTRICT.

This district was in the charge of Col. Frederic V. Abbot, Corps of Engineers. Division engineer, Col. W. M. Black, Corps of Engineers.

1. *Improving Pollock Rip Channel through the shoals lying near the entrance to Nantucket Sound, Mass.*—No improvement of this locality has been made. At present, the northerly passage over the shoals near the eastern entrance to Nantucket Sound, known as the Monomoy Shoal, is very crooked, and in places, narrow. It is subject to very strong tides and directly exposed to the full force of the easterly storms of the ocean. This passage is about 12½ miles in length measured from the Handkerchief Light Vessel to the whistling buoy north of Pollock Rip Slue, and with a 21-foot depth, varies in width from about 2,000 to 3,600 feet with a width of many miles as the Handkerchief Light Vessel is approached. The limiting depth in the passage over the shoals is about 27 feet. The locality is about 26 miles to the eastward of Vineyard Haven Harbor and about 60 miles to the southward of Provincetown at the northern extremity of Cape Cod.

The existing project adopted by the river and harbor act of July 25, 1912, provides for the improvement of the north or Pollock Rip Channel through the shoals lying near the entrance to Nantucket Sound by dredging to a depth of 30 feet at mean low water, using for the purpose an available Government-owned plant under appropriations aggregating $250,000 to make a more definite determination as to what amount of additional work of improvement is advisable. The reports on the preliminary examination and survey of this locality are printed in House Document No. 536, Sixty-second Congress, second session.

No modifications have been made in the existing project since its adoption.

Operations have not commenced under the project.

No funds have been expended.

The work will be done by hired labor and use of Government plant.

It is estimated that a commerce of over 20,000,000 tons annually will be benefited greatly if it be practicable to construct and maintain the proposed channel.

It is proposed to apply the funds estimated as a profitable expenditure for the fiscal year ending June 30, 1914, to continuing the excavation of the proposed straight channel, which it is expected will make a portion of the improvement available.

Amount appropriated by river and harbor act approved July 25, 1912	$125,000.00
Amount available for the fiscal year ending June 30, 1913	125,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 125,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 125,000.00

(See Appendix C 1.)

2. Harbors at Hyannis and Nantucket, Mass.—These works were consolidated by the river and harbor act of 1902.

(*a*) *Harbor of Refuge at Hyannis, Mass.*—The harbor of Hyannis lies on the south shore of the peninsula of Cape Cod and about 15 miles to the westward of the heel of the cape, and is an important harbor of refuge for the smaller class of vessels passing through Nantucket Sound.

This harbor, before improvement, was an open roadstead, exposed to southerly storms. About 8 feet at mean low water could be carried to the site of the present wharf of the New York, New Haven & Hartford Railroad Co.

In the years 1827–1838 a breakwater 1,170 feet long was constructed of riprap granite, covering an anchorage of about 175 acres, the entrance to which has a depth of about 15.5 feet. The harbor is about 20 miles east-northeast from Vineyard Haven on the island of Marthas Vineyard, Mass., and about 85 miles from the harbor of Provincetown, at the northern extremity of Cape Cod, which is the first sheltered harbor to be encountered after leaving Hyannis in rounding the cape.

Between the years 1852 and 1882, extensive repairs were made, increasing the width of the base of the breakwater and the size of the stone forming its sides and top.

The sum of $123,431.82 had been expended at this harbor prior to operations under existing project.

The existing project, that of August 5, 1886, House Document No. 96, Forty-eighth Congress, second session, with map; also printed at page 619, Annual Report of the Chief of Engineers for 1885, with maps at page 560 of same report, provided for dredging to 15.5 feet at low water about 36 acres area north of the existing breakwater, so as to increase the deep-water anchorage by that amount, all at a total estimated cost at that time of $45,743.20, increased $30,568.94 in accordance with the report of November 27, 1899, printed in House Document No. 79, Fifty-sixth Congress, first session, also printed without map on page 1284, Annual Report of the Chief of Engineers for 1900, and adopted by the river and harbor act of June 13, 1902, making the total estimated cost $76,312.14. The only change by this modification was in the estimated cost of the work.

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[1] Exclusive of amount available for fiscal year 1913.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entire improvement					1884 [1]	592
					1885 [1]	560
					1885 [2]	619
					1893 [1]	804
					1895 [1]	656
					1895 [2]	744
					1903 [1]	788

The project under which the work has been conducted and which has now been completed provided for deepening to 15.5 feet at mean low water an area of about 36 acres north of the existing breakwater to increase the deep-water anchorage by that amount.

At the adoption of this project the 15.5-foot depth anchorage covered only about 47 acres, and the 36 additional acres to be dredged carried a depth of from 7 to 15.5 feet of water at low water.

The total amount expended on this project to June 30, 1912, was $74,112.19, of which $161.43 was applied to maintenance. Under the 1884 project the 36 additional acres had been dredged to 15.5 feet at mean low water, and two cuts, each 25 feet wide and 13 feet deep at mean low water, had been dredged in the channel leading to the wharf of the New York, New Haven & Hartford Railroad Co., completing the project. No work was done during the fiscal year ending June 30, 1912.

The amount expended during the fiscal year 1912 was for liabilities incurred in making examination of the harbor. Some deterioration has taken place in the depth, and it is estimated that it will cost $24,000 for its restoration. The shoalest portion of the improvement it in the extreme northwesterly corner, where the depth is 9.6 feet at mean low tide. The greater portion of the area dredged maintains its depth.

The mean rise and fall of the tide is about 3 feet.

The principal value of this harbor to commerce is as a harbor of refuge for coasters and fishing vessels. The actual commerce of the place is, in general, lumber and other building materials, coal, and fish, aggregating in the last calendar year 2,434 short tons, valued at $229,400. So far as known, the improvement has had no effect on freight rates.

It is proposed to expend the amount estimated as a profitable expenditure for the fiscal year ending June 30, 1914, in restoring the depth of 15.5 feet at the points where shoaling has occurred.

July 1, 1911, balance unexpended	$246.99
June 30, 1912, amount expended during fiscal year, for works of improvement	3.25
July 1, 1912, balance unexpended	243.74
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[3]24,000.00

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[1] Contains maps. [2] No maps. [3] Exclusive of the balance unexpended July 1, 1912.

(*b*) *Harbor of refuge at Nantucket, Mass.*—This harbor is the only one between the harbors of Marthas Vineyard (Vineyard Haven and Edgartown) and Provincetown, a distance of 100 miles, except the small harbor of Hyannis on the north side of Nantucket Sound. It has a total area, below "First Point" on Coatue Beach, of about 502 acres, of which 102 acres has a depth of water in excess of 12 feet, and the object of the improvement is to make it a harbor of refuge for vessels plying between ports north and south of Cape Cod. Incidentally, it forms a commercial harbor for the island of Nantucket, and it is the only one on the island. So far as known, it has never been used to any great extent as a harbor of refuge. It is 32 miles from the harbor of Vineyard Haven on the island of Marthas Vineyard, Mass., and 80 miles from the harbor of Provincetown at the northern extremity of Cape Cod, which is the first sheltered harbor to be encountered in rounding the cape.

In its original condition the channel entrance was obstructed by a bar 1.5 miles in width, on which there was only 6 feet of water at mean low tide, the channel being very crooked and subject to changes in location.

Between 1829 and 1844 an ineffectual attempt was made to dredge a channel through the bar; and $45,734.75 was expended prior to beginning operations under the existing project.

The existing project, adopted June 14, 1880 (House Doc. No. 18, 46th Cong., 2d sess.; p. 423, Annual Report of Chief of Engineers for 1880, Part I), and modified July 21, 1885 (p. 564, Annual Report of the Chief of Engineers for 1885), provides for the construction of two converging jetties on either side of the entrance to the harbor and for dredging when necessary in order to obtain a channel depth of from 12 to 15 feet at mean low water. Estimated cost, $375,000, exclusive of cost of dredging. In 1905 a further modification of the project was made by adding $100,000 for dredging to the original estimated cost of the project, making the total estimated cost $475,000.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
	House	97	Twentieth	Second		
(1)	do	75 (Pt. 8)	Forty-third	do	1875	374 (Pt. II)
Project document [2]					1880	423

[1] No maps.

[2] Contains maps.

The actual project under which work is at present conducted provides for securing a channel depth of 12 to 15 feet at mean low water from Nantucket Sound into the harbor, that depth to be secured and maintained by means of converging jetties and by dredging between them.

The operations during the fiscal year were for maintenance, and consisted in deepening the channel by dredging to a depth of 15 feet and a width of approximately 200 feet, the central portion of which had a depth of 17 feet at mean low water for a width of 100 feet.

The amount expended during the fiscal year was $62,089.84.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, exclusive of outstanding liabilities, was $471,793.05, of which $112,089.84 was expended in dredging and $55,511.90 for maintenance. Of the maintenance expenditures, $7.210 was used on the west jetty, $6,312.90 on the east jetty, and $71,908 on dredging.

In the original project for this work the height of the jetties above mean low water was left to be determined by experience, and it will be some years before the work can be considered as completed. Up to the close of the fiscal year ending June 30, 1912, the eastern jetty had been built to its full length, but only of partial cross section; the west jetty had been built out 83 per cent of its total projected length. A channel had been dredged of the above dimensions with a depth on the outer bar of from 17 to 20 feet, which in nine months since the work was done has shoaled to from 15 to 18 feet. The shoalest part of the locality under improvement is 12.8 feet at mean low tide, although there is an available channel of 15 feet depth, with a minimum width of 100 feet. The mean rise and fall of the tide is 3 feet. The length of the channel between the inside and outside 12-foot contours is 1.32 miles.

The entire commerce of the island of Nantucket is carried on at this harbor, and amounted in the year 1911 to about 36,630 short tons, valued at $1,283,173, consisting mainly of general merchandise, building material, coal, forage, grain, live stock, fish, and shellfish. The harbor was also used to a small extent as a harbor of refuge for small fishing vessels and yachts. So far as known, the project has had no effect on freight rates.

It is proposed to apply the available funds and those asked for toward enlarging and maintaining the channel by dredging or to such work on the jetties as may be desirable.

For reference to reports containing more detailed information see Annual Report of the Chief of Engineers for 1905, page 76.

July 1, 1911, balance unexpended	$69,623.54
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	62,089.84
July 1, 1912, balance unexpended	7,533.70
Amount (estimated) required to be appropriated for completion of existing project	[1] 51,312.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 51,312.00

CONSOLIDATED.

July 1, 1911, balance unexpended		$69,870.53
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$3.25	
For maintenance of improvement	62,089.84	
		62,093.09
July 1, 1912, balance unexpended		7,777.44

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[1] Exclusive of the balance unexpended July 1, 1912.

Amount (estimated) required to be appropriated for completion of existing project	[1] $51,312.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 75,312.00

(See Appendix C 2.)

3. Woods Hole Channel, Mass.—Woods Hole Channel is a waterway or strait connecting Buzzards Bay and Vineyard Sound through the so-called "Great Harbor," lying near the southwestern part of Cape Cod, Mass. Little Harbor lies to the east of Great Harbor and is separated from it by Parkers Neck.

Before improvement in the strait the channels were crooked and obstructed by bowlders, and the velocity of the currents at certain stages of the tide was from 5 to 7 miles per hour. The site of the wharves and basins of the United States Fish Commission and Revenue-Marine Service was a submerged point of land from the shore of Great Harbor.

The original project of 1879 provided for making a channel through the bar at the entrance to Little Harbor and widening and deepening the channel through the strait. The project of 1883, extended in 1884 and 1886, provided for the construction of retaining walls on shore, a stone pier, and a wooden wharf, mainly for the use of the United States Fish Commission and incidentally for the use of other branches of the public service, all of which work had been completed prior to 1889.

The project of March 3, 1905, provided for widening and deepening the entrance channel to the wharf of the Lighthouse Establishment in Little Harbor, which was completed in 1905.

The amount expended on the original and modified projects prior to beginning operations on the existing project was $113,599.92, by which the entrance to Little Harbor had been dredged to 12 feet depth at mean low water and a width of 150 feet with a turning basin 800 feet wide in front of the wharf of the Lighthouse Establishment, and a direct channel 9 feet deep had been dredged through the strait. The retaining walls, stone pier, and wooden wharves at the United States Fish Commission had also been built and repaired.

The existing project, that of June 3, 1896, provides for deepening the channel through the strait to 13 feet at mean low water, and widening the same to 300 feet, with a branch channel of same dimensions leading from the strait toward Vineyard Sound; estimated cost, $396,000. The report on the survey upon which this project is based is printed at page 750 of the Annual Report of the Chief of Engineers for 1895.

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[1] Exclusive of the balance unexpended July 1, 1912.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Woods Hole Channel	House	84	Forty-third	Second	1874 [1] (Pt. II)	275
Little Harbor	Senate	22	Forty-fifth	Third	1879 [1]	299
Pier and breakwater in Great Harbor. [1]					1882	560
Wharves and basin of the United States Fish Commission. [2]					1884	598
Woods Hole Channel [1]					1898	860
Do [2]					1906	793
Little Harbor	House	[2] 162	Fifty-eighth	Second	1904 [1]	931
Do [2]	do	692	Sixty-first	do		

[1] No maps.

[2] Contains maps.

No modification of the existing project has been made since its adoption.

The operations during the year have consisted in the removal of the points projecting above the level of 13 feet below mean low water through the central 100 feet of width of the main channel, and at the close of the fiscal year this was very nearly completed. Upon the completion of the central 100 feet of width the two other sections, each of 100 feet width, will be cleared of obstructions.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, exclusive of outstanding liabilities, was $172,970.15, resulting in the cutting of channels through all the shoals, which are composed of large and small bowlders, and the final clearing out of nearly all obstructions above the plane of 13 feet at mean low water in the central 100 feet width of the main channel.

The maximum draft that can be carried over the shoalest part of the main channel is 10 feet at mean low water.

The mean rise and fall of the tide is about 4 feet at the Buzzards Bay end of the channel and 1.65 feet at the Vineyard Sound end.

The length of the improved portion of the main channel is about 0.8 of a mile and of the "Broadway Channel" about 0.26 of a mile.

The total commerce of Woods Hole amounts to 49,128 short tons, valued at $3,049,325.84, consisting chiefly of coal, lumber, and other building materials, fish, and general merchandise. It is not known that any effect on freight rates has been produced by the improvement.

No account was kept of vessels passing through the straight and not stopping at Woods Hole.

It is proposed to expend the available balance in completing the straight channel from Buzzards Bay to Great Harbor.

For reference to reports containing more extended information see Annual Report of the Chief of Engineers for 1905, page 70.

July 1, 1911, balance unexpended	$59,639.95
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,610.10
July 1, 1912, balance unexpended	57,029.85
July 1, 1912, outstanding liabilities	170.60
July 1, 1912, balance available	56,859.25
July 1, 1912, amount covered by uncompleted contracts	49,650.00

(See Appendix C 3.)

4. *Harbors of New Bedford and Fairhaven, Mass.*—New Bedford Harbor is an estuary of Buzzards Bay, at the mouth of the Acushnet River, the Fairhaven side of the harbor being called Fairhaven Harbor.

Before improvement the channel had a depth of 12.5 feet at mean low water.

The entire harbor extends in a northerly and southerly direction for about 5 miles. The upper 2 miles are about three-fourths of a mile wide and the lower 3 miles about 1⅞ miles wide. The northerly end narrows into the Acushnet River, which extends about 1½ miles farther north, when it becomes very shallow. The lower end opens into Buzzards Bay between Clark and Sconticut Points. A large portion of this area has very little depth. It is about 21 miles by water to Vineyard Haven Harbor, on the Vineyard Sound, in a southeasterly direction, and about 42 miles to Point Judith Harbor, to the westward.

The improvement of this harbor has been carried on under a number of distinct projects, the first being the removal of a wreck and dredging the sand bar formed by it in 1836–1839, on which $10,000 was expended. The projects of 1874 and 1877 provided for a channel 300 feet wide and 15 feet deep at mean low water from the deep water just above Palmers Island to the wharves of New Bedford. This work was completed in 1877 at a cost of $20,000. This was followed after 1887 by various projects in which the controlling depth was 18 feet at mean low water and comprised channels 200 feet wide from Buzzards Bay to New Bedford, about 150 feet wide along the city wharf front above and below the New Bedford and Fairhaven Bridge, an anchorage area about one-half mile long and 600 feet wide on the northerly side of the main channel between New Bedford and Fairhaven, and a channel 250 feet wide leading from the anchorage area through the draw in the bridge to the wharves above, with a turning basin above the bridge. The total cost of the 18-foot projects, which were completed in 1906, was $137,709, making a total of $167,709 expended prior to the adoption of the existing project.

The existing project was adopted by the river and harbor act of March 2, 1907, and is based upon the report of the preliminary examination and survey published as House Document No. 271, Fifty-ninth Congress, second session. It provides for dredging channels 25 feet deep at mean low water, 300 feet wide from Buzzards Bay to the north end of Fish Island, just above the New Bedford and Fairhaven Bridge, with a turning basin above the bridge, and an anchorage area of about 114 acres, 25 feet deep, between New Bedford and Fairhaven, at an estimated cost of $527,000. This project was modified by the river and harbor act of March 3, 1909, so as to include the extension of the basin above Fish Island southward between the harbor lines to the bridge between New Bedford and Fish Island, and the extension of the 25-foot channel along the New Bedford front from its terminus under the 1907 project northerly between established harbor lines to said bridge. This modification was authorized provided it could be made within the limit of cost of the 1907 project.

References to examination and survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No	Congress.	Session.	Year.	Page.
15-foot channel from Palmers Island to wharves of New Bedford.	House	75 (Pt. 3)	Forty-third	Second	1875 (Pt. II)	283
18-foot channel from Buzzards Bay to wharves at New Bedford.	do	[1] 86	Fiftieth	First	1888 [2]	518
Anchorage area 18 feet deep	do	[1] 59	Fifty-fourth	do	1896 [2]	672
18-foot channel to new draw in bridge.	do	[1] 146	do	Second	1897 [2]	960
18-foot turning basin above bridge and removal of a bar in front of wharves.	do	[1] 169	Fifty-sixth	First	1900 [2]	1296

[1] Contains maps. [2] No maps.

The actual project with all modifications under which work is now in progress provides for a channel 300 feet wide from Buzzards Bay to the north end of Fish Island just above the New Bedford and Fairhaven bridge, with a turning basin above the bridge and an anchorage area of about 114 acres below the bridge between New Bedford and Fairhaven and extending to the harbor line on the New Bedford side, together with short channels above and below the bridge in the old passage between New Bedford and Fish Island connecting with the other areas now being dredged. All dredging under the project is to a depth of 25 feet at mean low water.

This project has been modified by the river and harbor act approved July 25, 1912, in accordance with report printed in House Document No. 442, Sixty-second Congress, second session, which contemplates the extension of the channel up the Acushnet River from the upper anchorage basin to Belleville, 2.15 miles, on which part of the harbor no work has yet been done by the United States, the channel to be made 18 feet deep at mean low water, 100 feet wide at the bottom, with increased width at the bend below Coggeshall Street Bridge, and a turning basin about 300 feet wide at the upper end, at an estimated cost of $56,610, with $3,000 annually for maintenance, subject to the condition that local interests construct a new bridge at Coggeshall Street, with at least one draw opening of 100 feet, and the building of a substantial wharf by the city upon its property at Belleville. The full amount estimated above is appropriated by the said act.

Operations during the past fiscal year have consisted of dredging the approach channel to its full width of 300 feet up to the north end of Palmers Island and there connecting with the anchorage area, about four-tenths of which has been dredged. The entire area dredged will be cleared of any shoals that may have been left before being accepted as complete.

The expenditures made during the fiscal year, exclusive of outstanding liabilities, were $88,599.71, all of which was for new work.

Some ledge rock at the junction of the approach channel with the anchorage area near the north end of Palmers Island, discovered during the progress of dredging operations in the harbor, will have to be removed in order to complete the project, which work, perhaps, can not be accomplished within the originally estimated cost of the project.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $384,486.82, exclusive of outstanding liabilities, all of which was for new work.

The work is carried on under a continuing contract.

The turning basin and channel above the drawbridge and the channel leading from the anchorage area to the drawbridge for a width of about 200 feet have been practically completed; about one-half of the anchorage area has been deepened to 25 feet and the channel 300 feet in width has been dredged from Buzzards Bay to the anchorage area, but both the dredged portion of the anchorage area and the latter channel contain shoals still to be removed. The dredging near the north end of Palmers Island uncovered an area of ledge rock within the channel lines upon which the least depth of water is 15.5 feet.

About 24.2 feet of water at mean low tide can now be carried from Buzzards Bay through the harbor to the drawbridge, about 3 miles. About 18 feet can be carried through the bridge, and 25 feet from the bridge through the turning basin, about 0.2 mile. A farther distance of about 2 miles up the Acushnet River is navigable, with a natural depth of from 6 to 15 feet of water. The work is still incomplete. The rock near the north end of Palmers Island, referred to above, is a particularly dangerous obstruction to vessels of heavy draft attempting to use the new channel. The limiting depth of 18 feet at the New Bedford and Fairhaven Bridge is due a city water pipe crossing the channel, which the city proposes to lower during the present season.

The mean range of the tide is about 4.2 feet.

The commerce of the harbor in 1911 amounted to about 1,563,908 short tons, consisting mostly of coal, building materials, general merchandise, and cotton, valued at $40,275,610.80.

The effect of the deep water on commerce is the use of deeper draft vessels than formerly, with larger cargoes. So far as is known, the project has had no effect on freight rates.

The discovery of the rock ledge above referred to may make it impossible to complete the project within the estimate. The additional work proposed is necessary to make the improvement available, and also for the extension of benefits.

July 1, 1911, balance unexpended	$104, 113. 29
Received from sale of property	31. 88
	104, 145. 17
June 30, 1912, amount expended during fiscal year, for works of improvement	88, 599. 71

July 1, 1912, balance unexpended	$15,545.46
Amount appropriated by river and harbor act approved July 25, 1912	56,610.00
Amount appropriated by sundry civil act approved August 24, 1912	127,000.00
Amount available for fiscal year ending June 30, 1913	199,155.46
July 1, 1912, outstanding liabilities	35,692.17
July 1, 1912, balance available	163,463.29
July 1, 1912, amount covered by uncompleted contracts	87,164.79
Amount of continuing contract authorization, act of February 27, 1911	127,000.00
Amount appropriated under such authorization	127,000.00

(See Appendix C 4.)

5. *Sakonnet Harbor, R. I.*—Sakonnet Point is a rocky headland on the eastern side of the mouth of Sakonnet River, and lies about 6 miles east of Newport. This point in connection, with Churchs Cove, forms an anchorage known as Sakonnet Harbor. Before improvement this harbor was protected from storms from the northeast, south, and southeast by the mainland, but was exposed to westerly storms.

That portion of the harbor protected from all but the northwesterly storms has a width of about 1,000 feet in an easterly and westerly direction and the same distance in a north and south direction, with the southern boundary nearly semicircular. It is about 37 miles in a general westerly direction from Vineyard Haven Harbor and about 17 miles in a general easterly direction from Point Judith Harbor.

In 1827 a project was prepared for a breakwater 400 feet long at this point, and about 200 feet of this was built at that time. The project of 1899 provided for prolonging the old breakwater out to a rock nearly north of it and raising the whole to a height of 8 feet above mean low water. This project was completed in 1900, at a cost of $25,000. The project adopted by the act of March 2, 1907, provided for the removal of a rock from the harbor to the depth of 8 feet at mean low water, at an estimated cost of $10,000. This was completed in 1909.

All projects for this work have been completed. A report on a preliminary examination of the harbor with a view to further improvement was submitted December 24, 1910, and was printed as House Document No. 264, Sixty-second Congress, second session. The report was unfavorable to further improvement.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Breakwater					1889 [1]	649
Do					1895 [1]	749
Do	House	[2] 81	Fifty-fifth	First	1897 [1]	985
Removal of rocks	do	[1] 99	Fifty-sixth	Second	1901 [1]	1150
General improvement	do	[1] 264	Sixty-second	do		

[1] No maps.

[2] Contains maps.

The entire work at this locality has consisted in extending the original breakwater and removing a ledge of rock to a depth of 8 feet at mean low water.

The operations during the past year have consisted in making a preliminary examination of the locality and report thereon.

The amount expended on all projects since that of 1899 up to the close of the fiscal year ending June 30, 1912, was $13,147.63.

No further work is at present proposed at this harbor. Pending further authorization by Congress, or the necessity of additional work of maintenance, this project will be dropped and no further annual reports be submitted.

The commerce of this harbor amounted, in 1911, to about 8,736 short tons, consisting largely of coal and other fuel, general merchandise, grain, and fish, valued at about $638,787.60.

So far as known, the project has had no effect on freight rates.

July 1, 1911, balance unexpended	$158.79
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	158.79

(See Appendix C 5.)

6. Taunton River, Mass.—This river rises in Norfolk County, Mass., flows in a general south by west direction a distance of about 44 miles, and empties into Mount Hope Bay at Fall River. The portion between Taunton and Dighton, about 6 miles in length, is under improvement; and the distance from Dighton, the lower end of the improvement, is about 8 miles from the mouth.

In its original condition the channel was narrow and obstructed by bowlders, and from Berkeley Bridge to Taunton the depth was in places not more than 5 feet at mean high water. A vessel of 30 tons burden was as large as could go up to Taunton.

From 1870 to 1879, $63,000 was appropriated and expended to secure 9 feet depth at high water. This work was completed in 1879.

The existing project, adopted June 14, 1880, printed in Senate Document No. 61, Forty-sixth Congress, second session, provides for the widening and deepening of the river so as to secure a channel of at least 12 feet depth at high water, with 100 feet width from its mouth up to Berkeley Bridge (above Dighton); thence 12 feet depth with 80 feet width (100 feet width at bends) up to Briggs Shoal; thence 11 feet depth with 80 feet width up to the "shipyard"; thence with 11 feet depth with 60 feet width up to Weir Bridge, Taunton; all at a total cost estimated in 1893 at $125,000, all of which has been appropriated.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Taunton to mouth	Senate	61	Forty-sixth	Second	1880[1]	373
Taunton to Dighton	House	[2] 86	Fiftieth	First	1888[1]	517

[1] No maps.

[2] Contains maps.

No modification has been made in the existing project. The report of November 21, 1887 (H. Doc. No. 86, 50th Cong., 2d sess.), had in view additional funds for completing the project.

The operations of the past fiscal year have been confined to preparations for a small amount of maintenance work.

The amount expended on the existing project up to June 30, 1912, exclusive of outstanding liabilities, was $137,242.08. About $28,473 of the above amount has been expended in the maintenance of the channel.

All of the projected work has been practically completed and the shoals offering the greatest obstruction to the navigation of the river have been redredged several times. Vessels of 11 feet draft can reach Taunton at high water, but at some points the 11-foot channel is narrow. The mean range of tide is about 5.5 feet at Dighton and 3.4 feet at Taunton. The improved section of the river is 6 miles long.

The head of navigation is about 1 mile above Weir Bridge, 14 miles above Fall River. No portion of the river above Weir Bridge has been improved.

The total tonnage on the improved part of Taunton River for the year 1911 was 137,854 short tons, valued at $755,998.65, consisting chiefly of coal, fire clay, and molding sand.

So far as known the project has had no effect upon freight rates.

It is proposed to apply the amount available to maintenance dredging between Dighton and Briggs Wharf where shoaling has occurred.

Further work on this river will be for the maintenance of the benefits secured by the improvement.

July 1, 1911, balance unexpended	$12, 759. 07
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1. 15
July 1, 1912, balance unexpended	12, 757. 92

(See Appendix C 6.)

7. *Harbor at Fall River, Mass.*—Fall River lies at the mouth of Taunton River, in the northeastern angle of Mount Hope Bay, which empties into the ocean through Narragansett Bay and Sakonnet River. It forms the port of entry of the city of Fall River, the largest cotton manufacturing city in the United States.

Before improvement the depth of water in the reentrant in the wharf line north of the Old Colony Steamboat Co.'s wharf was only about 6 feet, and a considerable area of the harbor, especially in the front of the upper wharves, carried much less depth of water than existed in its approaches.

The harbor is about 2 miles long, with a width of from one-fourth mile to 1 mile. It is about 23 miles to the southeast from Providence and about 18 miles northerly from Newport Harbor.

The project of 1874 provided for deepening an area in front of the wharves immediately north of the Old Colony Steamboat Co.'s wharf 160 feet wide to 12 feet, and an additional width of 100 feet to 11 feet at mean low tide. This improvement was completed in 1878 at a cost of $30,000.

The project of 1899, enlarged in 1902, provided for a channel 300 feet wide and 25 feet deep at mean low water along the city front between the Old Colony wharf and deep water at the upper end of the city front; also a channel of the same dimensions through Mount Hope Bay to connect the deep water in front of the city with the deep water of Narragansett Bay. This project was completed in 1907 at a cost of $175,412, since which date $20,009.51 has been spent for maintenance.

The existing project, adopted by the river and harbor act of June 25, 1910, is based on the report of a survey printed in House Document No. 778, Sixty-first Congress, second session, and provides for the removal to a depth of 25 feet at mean low water of a shoal occupying a central position in the harbor and extending the area of that depth to the harbor line along the eastern side of the harbor at an estimated cost of $143,000, with $6,000 annually for maintenance.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
	House	84	Forty-third	First	1874	284
	do	345	Fifty-third	Third	1895	727

No modification has been made in the existing project since its adoption.

The operations of the past fiscal year have consisted in dredging on the shoal in the central part of the harbor with the U. S. dredge *Gedney*. All operations have been confined to new work.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, exclusive of outstanding liabilities, was $56,301.88.

About 51 per cent of the existing project had been completed up to June 30, 1912.

The main work in Fall River harbor consists in dredging a shoal occupying a central position in the harbor with deep water above and below it. The work of the year has been confined to dredging on the shoalest portions of this area and has increased the depth over it from a minimum of 19.3 feet to a minimum of 21.4 feet with a considerable portion the full depth of 25 feet. At some parts of the portion of the work along the eastern harbor line upon which operations have not yet been commenced, the shoalest water is 6.7 feet at mean low water. The mean rise and fall of the tide is about 4.7 feet.

The commerce using Fall River Harbor during the year 1911 amounted to 1,388,784 short tons, valued at $55,416,315.84, consisting of coal, cotton, general merchandise, fish and shellfish. This includes about 137,854 tons of freight passing into or leaving Taunton River.

So far as known, no effect has been produced on freight rates by the improvement.

July 1, 1911, balance unexpended	$119, 599. 22
Amount received from sale of property	18. 35
	119, 617. 57
June 30, 1912, amount expended during fiscal year, for works of improvement	32, 411. 12
July 1, 1912, balance unexpended	87, 206. 45
July 1, 1912, outstanding liabilities	2, 558. 80
July 1, 1912, balance available	84, 647. 65

(See Appendix C 7.)

8. Pawtucket (Seekonk) River, R. I.—This river is the upper portion of the Providence River, the navigable portion extending from Pawtucket to Providence, a distance of 4 miles. Before improvement the channel in the river was narrow and had a ruling depth of about 5 feet at mean low water.

The source of the river is in the vicinity of Worcester, Mass., and it flows in a general southeasterly direction for about 50 miles, emptying into Providence Harbor at Providence. At Pawtucket, about 4.5 miles above the mouth, a dam has been built across the river and forms the head of navigation. Above the dam at Pawtucket the river is known as the Blackstone River and is used as a partial source of power for many industrial establishments. The lower reaches of the river are called the Seekonk River.

Between 1867 and 1873 $52,000 was appropriated to dredge the channel to 7 feet depth. This work was finished in 1876. The project of July 5, 1884, provided for deepening the river so as to secure a channel of at least 12 feet depth at low water with 100 feet width from its mouth, at Providence, up to Grant & Co.'s wharf at Pawtucket, and thence 12 feet depth with 40 feet width through a ledge rock for a short distance farther, to Division Street Bridge, the head of navigation, all at a total cost estimated in 1883 at $382,500, of with $284,000 has been appropriated. The river and harbor act of March 3, 1899, modified this project so as to provide for straightening that portion of the channel between Tenmile River and Bucklins Island. The project, with its modification, has been completed, with an expenditure of $282,444.91. The total expenditures prior to the adoption of the existing project were $334,444.91.

The existing project, based on report of survey printed in House Document No. 113, Fifty-sixth Congress, first session, and adopted by the river and harbor act of March 3, 1905, provides for deepening the channel to 16 feet at mean low water with 100 feet width and a channel through the ledge rock at Pawtucket of 16 feet depth at mean low water and 50 feet wide, at an estimated cost of $237,875.

The appropriation of $30,000 made by the act of 1905 was applied to excavating a channel through about 200 feet in length of ledge rock.

The river and harbor act of March 2, 1907, contains the following item:

Improving Pawtucket River, Rhode Island: Completing improvement, one hundred and thirty-five thousand five hundred and eighty-four dollars: *Provided*, That no part of this sum shall be expended unless the further amount of sixty-seven thousand seven hundred and ninety-two dollars shall be provided by the State of Rhode Island or other agency, and made subject to the order of the Secretary of War in such manner as he may direct, to be expended under his direction upon said project for its completion.

The General Assembly of the State of Rhode Island passed an act making this appropriation, but—

> *Provided*, That requisition for one-half of said sum shall be made on or after the first day of July, anno Domini nineteen hundred and eight, and requisition for the remainder of said sum shall be made on or after the first day of July, anno Domini nineteen hundred and nine, by said Secretary of War.

In accordance with the provisions of the act of March 2, 1907, separate contracts were entered into for all of the rock excavation and dredging required for the completion of the project.

Section 3 of the river and harbor act of March 3, 1909, modified this project as follows:

> Pawtucket River, Rhode Island: Any balance remaining unexpended after the completion of the work provided for under the existing contracts for improving the Pawtucket River, Rhode Island, may be used in deepening the channel of the river to eighteen feet, and in increasing the widths thereof at such places between Pawtucket and Providence as may best subserve the interests of commerce: *Provided*, That the work herein authorized shall not be undertaken until the consent of the State of Rhode Island shall have been given for the application to this purpose of the portion of said balance heretofore contributed and pledged by the said State.

In accordance with this act the General Assembly passed the following resolution on April 2, 1909:

> Whereas the Congress of the United States has by law enacted that the appropriations or authorizations for appropriations heretofore made with reference to the Pawtucket River, Rhode Island, may, in the discretion of the Secretary of War, and upon the recommendation of the Chief of Engineers, be diverted or applied upon modified projects for said Pawtucket River, as follows, viz: Any balance remaining unexpended after the completion of the work provided for under the existing contracts for improving the Pawtucket River, Rhode Island, may be used in deepening the channel of said river to eighteen feet and in increasing the widths thereof at such places between Pawtucket and Providence as may best subserve the interests of commerce: *Provided*, That the work herein authorized shall not be undertaken until the consent of the State of Rhode Island shall have been given for the application to this purpose of the portion of said balance heretofore contributed and pledged by said State.
>
> *Be it therefore resolved*, That the consent of the State of Rhode Island is hereby given for the application to the said purpose of the portion of the balance of the appropriation heretofore contributed and pledged by the State of Rhode Island for said improvements of said Pawtucket River.

Reference to examination and survey reports and maps and plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Between Division Street Bridge, Pawtucket, and Red Bridge, Providence.	Senate	46	Forty-eighth	First	1884[1]	609
	House	[2] 113	Fifty-sixth	do	1900[1]	1902
	House	[1] 141	Fifty-ninth	do		

[1] No maps.

[2] Contains maps.

The existing project, with its various modifications, provides for a channel from Red Bridge, in Providence, to the lower wharves in Pawtucket, 100 feet wide, with an increase in the width at the bend opposite Phillipsdale, R. I., and an extension through the ledge rock between the wharves in Pawtucket 60 feet wide, all 16 feet deep at mean low water, with the further provision of increasing the depth to 18 feet as far as the funds will permit.

The operations during the year have consisted in completing the dredging of the 16-foot channel to its full width of 100 feet and widening it opposite Phillipsdale to about 275 feet, and the removal of the area of ledge rock found within the limits of the 100-feet wide channel below Pawtucket, all to a depth of 16 feet below mean low water. Also the widening of the upper part of the channel through the ledge between the wharves at Pawtucket to 60 feet and its deepening to 18 feet for a length of about 350 feet. The ledge rock work requires the removal of a few points of rock yet before it is completed. The expenditures during the year amounted to $21,717.03 of United States funds and $19,849.93 of the funds of the State of Rhode Island.

The amount expended upon the existing project up to June 30, 1912, exclusive of outstanding liabilities, was $158,846.62 appropriated by the United States and $66,833.85 by the State of Rhode Island.

About 95 per cent of the entire project has been completed, and a 16-foot channel 100 feet wide can be carried to Pawtucket, with an enlargement in width to 275 feet at Phillipsdale, affording greater facilities both for landing at that point and the passage of tows bound up and down the river, and practically an 18-foot depth for handling barges in the ledge rock channel. The mean rise and fall of the tide is about 5 feet. The entire length of the improved section is 3½ miles. The head of navigation is at the dam in Pawtucket. The length of the navigable portion of the stream is 4.5 miles.

The total amount of commerce on this river during the year 1911 was 508,625 short tons, chiefly coal, fish, oysters and oyster shells, and building materials, valued at $6,380,722.60.

It is not known that any effect has been produced on freight rates by the improvement.

It is proposed to apply the funds available to the completion of the project.

For reference to report containing more extended information, see Annual Report of Chief of Engineers for 1905, page 84.

July 1, 1911, balance unexpended	$35,029.09
Received from sale of property	31.88
	35,060.97
June 30, 1912, amount expended during fiscal year, for works of improvement	21,717.03
July 1, 1912, balance unexpended	13,343.94
July 1, 1912, outstanding liabilities	1,136.91
July 1, 1912, balance available	12,207.03
July 1, 1912, amount covered by uncompleted contracts	8,229.60

(*See* Appendix C 8.)

9. Providence River and Harbor and Narragansett Bay, and Green Jacket Shoal, R. I.—(a) Providence River and Harbor and Narragansett Bay.—The object of this improvement is to furnish a wide and deep channel for foreign and coastwise commerce from the ocean to Providence and to provide a deep-water anchorage for that harbor.

Before the improvement of the river in 1853 the available low-water depth was limited to 4.5 feet.

The Providence River is formed by the union of the Seekonk, or Pawtucket River, with several smaller streams at Providence. It is a tidal river and extends southerly for about 8 miles to Conimicut Point, where it widens into Narragansett Bay.

Between 1852 and 1873, $59,000 was expended in securing first 9 feet and then 12 feet depth of channel.

The approved project of 1878, as modified in 1882, provided for deeping the river and deepening and widening its anchorage basins so as to secure a channel of at least 25 feet depth at low water with 300 feet width from the deep water of Narragansett Bay up to Providence, R. I., and so as to secure anchorage basins of 20 feet depth with 600 feet width, 18 feet depth with 725 feet width, 12 feet depth with 940 feet width, and 6 feet depth with 1,060 feet width from Fox Point to Fields Point, all at a total cost estimated in 1882 at $675,000. This project was completed in 1895.

Another project originating in the river and harbor act of June 3, 1896, provided for securing a ship canal 400 feet wide and of a depth of 25 feet at mean low water from Sassafras Point, in Providence Harbor, through Providence River and Narragansett Bay by the most direct route practicable to the ocean by way of the "Western Passage," so called, at an estimated cost of $732,820. This project was put under the continuing-contract system, and the amount expended on the work up to the close of the fiscal year ending June 30, 1908, exclusive of outstanding liabilities, was $476,210.28, by which the channel 400 feet wide and 25 feet deep has been completed from Sassafras Point to the deep water of Narragansett Bay by the Western Passage.

Under date of June 11, 1904, the Chief of Engineers authorized the use of $2,000 of the balance remaining on hand of the appropriation for securing a channel through the Western Passage of Narragansett Bay for the removal of certain obstructing rocks in Dutch Island Harbor, R. I.

Another project adopted by the river and harbor act of June 13, 1902, provided for an enlarged anchorage area of 25 feet depth, extending the full width of the harbor from Fox Point on the north to Long Bed and Sassafras Point on the south, including the area known as Green Jacket Shoal, but excluding a small area adjacent to the western harbor line between Harbor Junction pier and Sassafras Point, at an estimated cost of $607,778. This project was enlarged by the river and harbor act of March 2, 1907, so as to include an area of uniform width and 25 feet depth to the eastward of the main ship channel, between Long Bed and Kettle Point, for which $90,750 was appropriated, making the total estimated cost $698,528. The total amount expended on projects previous to the existing one was $1,859,480.35.

The existing projects, adopted by the river and harbor act of June 25, 1910, are two in number, one in accordance with report printed in House Document No. 919, Sixtieth Congress, first session, providing for the removal to a depth of 25 feet of a triangular shoal area in the southeastern part of the harbor, just north of Kettle Point, limited on the east by the harbor line and on the north and west by the areas already dredged, at an estimated cost of $184,800; and the other, in accordance with report printed in House Document No. 606, Sixty-first Congress, second session, providing for extending the 25-foot deep anchorage area to the western harbor line from just above Harbor Junction pier to Fields Point and widening the present 400-foot channel between Kettle Point and Gaspee Point to 600 feet, with certain easement of bends, at an estimated cost of $459,000. The act contains a provision that no part of this latter amount shall be expended until the Secretary of War shall have received satisfactory assurances that the city of Providence or other local agency will expend on the improvement of the harbor front an equal sum.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
East side Providence River, between Fox Point and Fields Point.		[1] Ex.Doc.107	Forty-second	Third	1873 [1]	969
23-foot channel, Providence to the sea.	Senate	34	Forty-fifth	Second	1878 [1]	238
25-foot channel, Providence to sea, and increasing the anchorage area in harbor.	do	45	Forty-seventh	First	1882 [1]	557
Green Jacket Shoal	do	42	Forty-eighth	Second	1885 [2]	601
Providence River, Providence Harbor, Green Jacket Shoal.					1893 [2]	830, 831, 832

[1] No maps.

[2] Contains maps.

The project under which work is now in progress, with all modifications, provides for dredging all of the harbor between Fox Point and Fields Point, limited on the east and west by the harbor lines, the cutting off of Fields Point back to the western harbor line, and widening the approach channel to a minimum width of 600 feet from Kettle Point to Gaspee Point; also restoring the depths in certain of the older portions of the work that have shoaled since originally dredged. The depth required for all work is 25 feet at mean low water.

During the past fiscal year a portion of the triangular shoal area in the southeast part of the harbor was removed, and the 25-foot depth available in the harbor was thereby widened about 250 feet. (H. Doc. No. 919, 60th Cong., 1st sess.) The widening of the approach channel between Kettle Point and Gaspee Point had been very nearly completed, there remaining only the cleaning up of certain shoals left in the first dredging to complete that portion of the work. The work of widening the harbor to the western harbor line is well under way. (H. Doc. No. 606, 61st Cong., 2d sess.) The State wharf on the west side of the harbor and the city quay wall between Sassafras Point and Fields Point, the assurances for the construction of which were given the Secretary of War in conformity with the requirements of the act adopting the project, are both under construction. The operations during the year were all for new work. The expenditures during the year amounted to $232,418.79, exclusive of outstanding liabilities.

The amount expended under the existing project up to June 30, 1912, exclusive of outstanding liabilities, was $294,494.81.

The work of widening the approach channel between Kettle Point and Gaspee Point and the widening of the harbor to the western harbor line from the vicinity of Harbor Junction Pier to Fields Point, both under the project described in House Document No. 606, Sixty-first Congress, second session, are in progress under continuing-contract appropriations, for which $429,000 has been appropriated and $30,000 remains to be appropriated.

About 58 per cent of the new work contemplated is completed. The approach channel has been widened from 400 feet to 600 feet, and while the additional width has not the full depth of 25 feet at all points, it is of great convenience to passing vessels, and the additional width given in the harbor affords relief to the often congested condition of the anchorage. The minimum draft on any of the improved portion is 18 feet, while portions of Fields Point which have not as yet been dredged are from 6 to 35 feet above the plane of mean low water. The length of the improved section of the river and harbor between Fox Point and Gaspee Point is 5¼ miles.

The mean rise and fall of the tide is 4.7 feet.

The commerce of Providence Harbor, including 508,625 short tons entering and leaving Pawtucket River, was 3,887,858 short tons, valued at $103,313,720.63, consisting chiefly of coal, oils, chemicals, general merchandise, fish, and shellfish.

So far as known, the works of improvement have had no effect upon freight rates.

It is proposed to apply the funds asked for to the completion of the project for removing the triangular shoal in the southeastern part of the harbor and the project for widening and straightening the approach channel between Kettle Point and Gaspee Point, and widening the harbor to the western harbor line at and above Fields Point. Both projects adopted by the river and harbor act of June 25, 1910.

(*b*) *Green Jacket Shoal.*—This shoal was in that part of Providence River which constitutes the harbor of Providence. It lay off the wharves on the south front of the city and occupied a part of the harbor that is required for anchorage purposes, covering an area of about 18 acres between the 15-foot curves and about 30 acres in all.

In its original condition the shoal in many places carried only 1 foot of water and was a very troublesome obstruction.

The project for the removal of this shoal was adopted August 5, 1886.

The sum of $104,250 was expended on this work up to June 30, 1904, by which 23.8 acres out of the original 30 of this shoal had been dredged to 25 feet depth, and a 16-foot depth had been secured over the central and largest portion of the shoal, in addition to a 20-foot depth in the main channel, making an important addition to the anchorage facilities of Providence Harbor.

In the river and harbor acts of June 13, 1902, and March 3, 1905, provision was made for the removal of the remaining portions of this shoal in connection with the project for an enlarged anchorage area in Providence Harbor, and all of the remaining portions of the shoal were removed under the appropriations made by these acts.

There has been some shoaling over those portions of the area dredged prior to this year, which probably extends along the eastern side of the recently dredged anchorage area.

The effect of the improvement is stated in connection with the report on Providence Harbor.

For reference to reports containing more extended information see Annual Report of the Chief of Engineers for 1905, page 85.

WIDENING APPROACH CHANNEL BETWEEN KETTLE AND GASPEE POINTS, REMOVING FIELDS POINT, ETC.

July 1, 1911, balance unexpended	$268,027.12
June 30, 1912, amount expended during fiscal year, for works of improvement	210,224.68
July 1, 1912, balance unexpended	57,802.44
July 1, 1912, outstanding liabilities	30,232.00
July 1, 1912, balance available	27,570.44
Amount appropriated by sundry civil act approved Aug. 24, 1912	104,000.00
Amount available for fiscal year ending June 30, 1913	131,570.44
July 1, 1912, amount covered by uncompleted contracts	115,254.64
Amount of continuing contract authorization, act of June 25, 1910	459,000.00
Amount appropriated under such authorization	429,000.00
Amount yet to be appropriated	30,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 30,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 30,000.00

ANCHORAGE AREA ON EAST SIDE.

July 1, 1911, balance unexpended	$22,200.00
June 30, 1912, amount expended during fiscal year, for works of improvement	22,194.11
July 1, 1912, balance unexpended	5.89
Amount (estimated) required to be appropriated for completion of existing project	[2] 164,800.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[2] 164,800.00

MAINTENANCE, ETC.

July 1, 1911, balance unexpended	$51,455.61
Received from sale of property	64.73
July 1, 1912, balance unexpended	51,520.34

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[1] Exclusive of amount available for fiscal year 1913.

[2] Exclusive of the balance unexpended July 1, 1912.

CONSOLIDATED.

July 1, 1911, balance unexpended	$341, 682. 73
Sale of property	64. 73
	341, 747. 46
June 30, 1912, amount expended during fiscal year, for works of improvement	232, 418. 79
July 1, 1912, balance unexpended	109, 328. 67
July 1, 1912, outstanding liabilities	30, 232. 00
July 1, 1912, balance available	79, 096. 67
Amount appropriated by sundry civil act approved Aug. 24, 1912	104, 000. 00
Amount available for fiscal year ending June 30, 1913	183, 096. 67
July 1, 1912, amount covered by uncompleted contracts	115, 254. 64
Amount of continuing contract authorization, act of June 25, 1910	434, 000. 00
Amount appropriated under such authorization	404, 000. 00
Amount yet to be appropriated	30, 000. 00
Amount (estimated) required to be appropriated for completion of existing project	[1] 194, 800. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 194, 800. 00

(See Appendix C 9.)

10. *Harbor at Newport, R. I.*—This harbor is at the main entrance to Narragansett Bay, and throughout the year it serves as an easily accessible harbor to foreign and coastwise commerce, and is a distributing point for tows of barges bound for Narragansett Bay points and points farther east. The inner harbor serves also as the harbor for the commerce of the port.

The outer harbor from "The Dumplings," at the entrance, to "Gould Island" is about 3¼ miles long with a width of 1½ to 1¾ miles, the greater portion of which has a depth of from 6 to 23 fathoms. The inner harbor, between Goat Island and Newport, extends north and south about 6,000 feet, including the northern entrance of about 1,500 feet, with a width of 750 feet between Long Wharf and the United States naval torpedo station. South of Long Wharf the harbor has a width of about 2,000 feet. It is about 12 miles northeasterly from Point Judith Harbor and 48 miles westerly from Vineyard Haven.

Before improvement the capacity of the inner harbor was limited by shoals, and it was not adequate to the number and size of the vessels seeking it for refuge. The southern or main entrance was obstructed by a bar which stretched out from Goat Island and the northern entrance by a sharp, rocky spit near Rose Island, and the general business wharves of the city could not be reached at low tide by vessels drawing more than 8 feet.

Between 1873 and 1875, $28,500 was appropriated to secure 12 feet depth in the harbor. This work was completed in 1876.

The project adopted in 1880 and modified in 1882, 1883, 1884, 1890, and 1895 provided for widening and deepening the channel from Narragansett Bay into Newport, so as to secure 15 feet depth at mean low water with at least 750 feet width; for the extension of the

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[1] Exclusive of amount available for fiscal year 1913.

13-foot depth and 10-foot depth anchorage basins, and for dredging a channel 10 feet deep along the State harbor line southward to opposite the gas company's wharf; for the partial cutting off of the shoal spit at the southern end of Goat Island; for the construction of jetties on the western shore of Goat Island, so as to protect the end of this island from erosion and to prevent the drift of sand, etc., around the island into the adjacent parts of the harbor and channel; and for the removal of Spindle Rock, a sharp, rocky spit near Rose Island; all at a total cost estimated in 1895 at $206,200. The amount expended on the original and modified projects prior to operations under the existing project was $244,695.71, by which the projected work was completed.

The existing project, adopted by the river and harbor act of March 2, 1907, provides for dredging a channel 750 feet wide and 18 feet deep at mean low water around the southerly end of Goat Island and northward through the harbor, in accordance with House Document No. 121, Fifty-eighth Congress, second session, for the extension of the 13-foot anchorage area southward to the harbor line and the removal of Nourmahal Rock in Brentons Cove off the Fort Adams shore to a depth of 18 feet, in accordance with House Document No. 438, Fifty-ninth Congress, second session, at a total estimated cost of $250,900, which has been appropriated. The river and harbor act of June 25, 1910, modified the existing project in accordance with the plan printed in House Document No. 610, Sixty-first Congress, second session, so as to provide for an anchorage area 18 feet deep at mean low tide to extend from the channel eastward to the Newport harbor line, limited on the north by the city wharf and east and west prolongations of the line of its south face, and on the south by a line running in a general southwesterly direction from Perry Mill Wharf, also by the removal of a portion of the shoal around the south end of Goat Island, at an estimated cost of $233,000.

The total estimated cost of the existing project as modified is $483,900.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No	Congress.	Session.	Year.	Page.
13-foot channel to wharves		Ex. Doc. 107	Forty-second	Third	1873 [1]	964
Increase of estimated cost of channel through harbor and 13 and 10 foot anchorage.					1882 [1] 1885 [1]	561 604
Spit, south end of Goat Island	House	[1] 180	Fifty-first	Second	1891 [1]	786

[1] No maps.

The existing project, as modified, provides for a channel 18 feet deep and 750 feet wide passing along the easterly side and around the southerly end of Goat Island and northward through the harbor; and for an anchorage area 18 feet deep at mean low tide to extend from the channel eastward to the harbor line on the east side of the harbor, limited on the north by the city wharf and east and west prolongations of the line of its south face, and on the south by a broken line running southwesterly from Perry Mill Wharf, also by the removal of a portion of the shoal around the south end of Goat Island. This project includes in addition to the above the removal of Nourmahal Rock in Brentons Cove, off Fort Adams, and the extension of the 13-foot anchorage area from the southerly limit of the 18-foot anchorage, southward to the harbor line, over that portion of the harbor lying to the eastward of the city stone pier.

The operations during the fiscal year have consisted in dredging the 18-foot anchorage area, which was completed with the exception of certain areas of ledge rock that were uncovered during the progress of dredging. The most dangerous points of rock have been buoyed pending later removal. The expenditures during the year were $136,605.71 exclusive of outstanding liabilities, all of which was for new work.

The amount expended under the existing project up to the close of the fiscal year ending June 30, 1912, was $340,365.39.

The work of dredging the 18-foot anchorage area was under a continuing-contract authorization, the funds for which have all been appropriated.

About 72 per cent of the existing project has been completed. There is now a channel 750 feet wide of 18 feet depth passing through the harbor and around the southern end of Goat Island, an 18-foot anchorage area extending into the wharf front of the city, and a wider and much better turn around the southern end of Goat Island of 18 feet depth. Nourmahal Rock has been removed to 18 feet depth and the 13-foot anchorage has been extended south to the harbor line. The latter, however, in its southerly part, carries some small ledge rock areas which project about 1 foot above the 13-foot depth. The mean rise and fall of the tide is about 3.75 feet.

As the improvement of the harbor has progressed there has been a large increase in the size and number of vessels using it. The commerce for 1911 was about 247,697 short tons, principally fish, coal, and general merchandise, valued at $6,277,438.14. In addition to the local commerce it is estimated that 497,758 short tons, having a value of $19,029,466, passed through the harbor and used it as a harbor of refuge.

It is not known that freight rates have been affected by the improvement.

It is proposed to apply the available funds to the removal of the areas of ledge rock uncovered in dredging.

July 1, 1911, balance unexpended	$280, 300. 45
Received from sale of property	58. 64
	280, 359. 09
June 30, 1912, amount expended during fiscal year, for works of improvement	136, 605. 71
July 1, 1912, balance unexpended	143, 753. 38
July 1, 1912, outstanding liabilities	24, 992. 87
July 1, 1912, balance available	118, 760. 51
July 1, 1912, amount covered by uncompleted contracts	7, 301. 25
Amount of continuing contract authorization, act of June 25. 1910	233, 000. 00
Amount appropriated under such authorization	233, 000. 00

(See Appendix C 10.)

11. Harbor of refuge at Point Judith, R. I.—Point Judith is the southern extremity of the township of Narragansett, R. I., and marks the southwestern entrance to Narragansett Bay. A long ledge, known as "Squid Ledge," projects over a mile from the shore in a direction south by east about 1.5 miles west of the point. This location was dangerous for vessels to pass during a storm, especially for the light-built barges transporting coal from New York Bay points to Narragansett Bay.

The harbor protected by the breakwaters covers an area of about 3,800 feet in a northerly and southerly direction and about 3,400 feet easterly and westerly, with an entrance 1,200 feet wide and from 23 feet to 31 feet in depth on the southeasterly side, and one 1,500 feet wide on the western side with a depth of about 18 feet. It is about 23 miles easterly from Stonington Harbor, Conn., and about 50 miles westerly from Vineyard Haven, these being important harbors on the line of the very large traffic bound east and west past this point.

The existing project is the only one ever adopted for this locality.

The existing project, adopted by the act of September 19, 1890, was based on House Document No. 66, Fifty-first Congress, first session, and provides for the construction at this point of a national harbor of refuge nearly a square mile in area by means of two stone breakwaters. The main breakwater, built partly on Squid Ledge, is approximately V-shaped, facing outward in a direction about south by west, and lying at a considerable distance from the shore. Eastward of the main breakwater a detached breakwater, nearly parallel to the line of the eastern arm of the main breakwater prolonged shoreward, was planned to shelter the eastern entrance, so as to give protection against easterly, southerly, and westerly storms, the mainland itself forming a protection on the north, all at a total cost estimated 1889 at $1,250,000. This project was modified by the report of a Board of Engineers convened to consider and report upon the construction of this harbor, which was approved November 16, 1896, and provided for raising the crest of the eastern arm of the main breakwater and extending its western arm to its originally projected length, at an estimated cost of $444,311, and deferring the construction of the easterly detached breakwater as a part of the main project until the completion of the main breakwater should demonstrate its necessity or otherwise. (Annual Report of Chief of Engineers for 1897, p. 920.)

The river and harbor act of June 13, 1902, made a further modification by providing for the construction of the easterly detached breakwater and continuing it to the shore, at an estimated cost of $196,193 for the detached breakwater and $187,558.80 for the shore extension. (H. Doc. No. 53, 55th Cong., 1st sess.) A further modification was made by the act of March 2, 1907, authorizing an extension seaward to the easterly shore arm breakwater at an additional estimated cost of $186,248.20, making the total cost of this breakwater $570,000. The river and harbor act of June 25, 1910, adopted so much of the plan of improvement set forth in House Document No. 911, Sixtieth Congress, first session, as provides for the construction of a detached westerly shore arm of the breakwater, at an estimated cost of $665,000, making the total estimated cost of the project $2,485,000.

Reference to examination or survey reports and maps or plans not in the project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Point Judith Pond	House	[1] 182	Fifty-fifth	Second	1898 [2]	985
Harbor	do	[1] 60	Fifty-eighth	do	1904 [2]	949
Do	do	[1] 935	Sixtieth	First		

[1] Contains maps. [2] No maps.

The project as modified provides for the construction, first, of a V-shaped breakwater, designated the main breakwater, facing about south by west; second, the construction of an easterly shore-arm breakwater extending out from the shore toward the easterly arm of the main breakwater, leaving an entrance to the harbor 1,200 feet wide; third, the construction of a westerly shore-arm breakwater extending out from the shore toward the westerly arm of the main breakwater, leaving an entrance 1,500 feet wide; and, fourth, the raising of the crest of the easterly arm of the main breakwater to the level of 13 feet above mean low water instead of 10 feet as originally built.

The operations during the past fiscal year have been mainly on the construction of the westerly shore arm, which, since the new quarry of the contractors has been fairly opened, is progressing rapidly. A contract has been entered into for repairs to the most exposed parts of the main breakwater and the easterly shore arm. The expenditures have been mainly for new work; that for maintenance has been the slight expense incident to making the contract for repairs.

The sum of $1,877,111.69 has been expended on this work up to June 30, 1912, of which $55,217.13 was for maintenance.

About 80 per cent of the entire project as approved has been completed. By the expenditures made, the main breakwater had been built to a total length of 6,970 feet, with a height of 10 feet above mean low water, the easterly shore-arm breakwater had been completed for a distance of 2,240 feet out from the high-water line on shore to about 30 feet depth of water, and the foundation of the westerly shore arm had been placed for a length of 1,930 feet out from the shore and about 350 feet raised above the surface of the water.

Before the construction of the breakwater the area inclosed within the lines upon which it has been built and the shore was about 640 acres, of which 390 acres has over 25 feet of water and 198 acres additional over 18 feet. The 18-foot area and the whole water-covered area has since been considerably reduced by shoaling in the western part. It is expected the western shore arm will stop the inflow of sand.

The result of the improvement has been to create a harbor of refuge fairly suitable for sailing vessels and steamers, though the holding ground is poor, but not well suited for tows of barges, on account of the narrowness of the entrances, the direction of the entering courses with respect to that of the worst seas, the lack of room necessary for maneuvering barges in tow, and the fact that the central part of the area is obstructed by a dangerous reef.

About 30 feet can be carried at mean low water into the eastern, and from 18 to 19 feet into the western, entrance. The mean range of tide is 3.1 feet.

One hundred and seventy-three vessels used the harbor during the fiscal year. Of these there were 142 sailing vessels, 12 steamers, and 19 barges.

It is proposed to apply the funds asked for to constructing the westerly shore arm of the breakwater, which is the only part of the new project presented in House Document No. 911, Sixtieth Congress, first session, specifically adopted by Congress. Work on the other items of this project will await the future action of Congress.

July 1, 1911, balance unexpended	$229,306.72
Received from sale of property	36.70
	229,343.42
June 30, 1912, amount expended during fiscal year, for works of improvement	42,931.45
July 1, 1912, balance unexpended	186,411.97
July 1, 1912, outstanding liabilities	37,392.85
July 1, 1912, balance available	149,019.12
Amount appropriated by sundry civil act approved Aug. 24, 1912	160,000.00
Amount available for fiscal year ending June 30, 1913	309,019.12
July 1, 1912, amount covered by uncompleted contracts	583,343.51
Amount of continuing contract authorization, act of Feb. 27, 1911	450,000.00
Amount appropriated under such authorization	160,000.00
Amount yet to be appropriated	290,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 290,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 290,000.00

(See Appendix C 11.)

12. *Entrance to Point Judith Pond, R. I.*—Point Judith Pond is a shallow salt pond, lying in the rear of the sandy beach of the Rhode Island shore, just west of Point Judith. Before improvement it was frequently cut off from the ocean.

The improvement desired at this place by the people of the neighborhood is the widening and deepening of the present opening into the pond and the extension of jetties for the maintenance of such opening.

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[1] Exclusive of amount available for fiscal year 1913.

The State of Rhode Island and the town of South Kingstown have made an opening into the pond.

No general project for the improvement of this channel has been formed. The appropriations of $7,500 made in 1892, $2,500 in 1894, and of $2,000 in 1905 were expended in extending and strengthening the western jetty, originally built by the State, for the expenses of the Board of Engineers authorized by river and harbor act of June 13, 1902, and for surveys.

The river and harbor act of March 2, 1907, provides $8,000 for "continuing improvement and for maintenance," "which amount shall be expended for dredging."

In 1905 the excavated channel through the beach proper was about 3,000 feet long and carried a navigable depth of about 6 feet, but for a like distance beyond this point there was practically no navigable depth at low tide, there being a wide sand bar crossed by irregular streams rarely carrying as much as 1 foot of water. On the pond side of this bar there was about 5 feet depth. The difference of level between the pond and the ocean, together with the relatively small sectional area of the channel, is such as to create very strong currents. No dredging through this bar would be permanent without some auxiliary directing works to control the flow of the current. An appropriation of $6,000 was made at the 1907 session of the Rhode Island General Assembly, and it was expected that the use of the combined appropriations might result in some benefit to the work, but the threatened cutting away of the sand behind the westerly jetty at the entrance to the pond made it necessary to use the State money in an effort to check this wash.

In the spring of 1909 it was found that a portion of the bar at the inner end of the channel had been carried farther into the pond, leaving a crooked channel through it, and still leaves a bar at the inner end of the new channel with about 3 feet of water on it at mean low water.

No useful result can be obtained by the expenditure of the $8,000 appropriated by the act of March 2, 1907, for dredging, and it seems desirable that Congress authorize this balance to be turned into the surplus fund of the Treasury.

The mean range of tide is 3.1 feet.

No part of the 1907 appropriation of $8,000 for dredging has as yet been used.

The total expenditures to June 30, 1912, was $12,000, resulting in improving the entrance to the extent stated above. The locality is not deemed worthy of further improvement at present.

The commerce of the pond is very small and consists mainly of oysters caught in the Point Judith Pond, which are shipped by rail.

References to examination or survey reports and maps or plans and in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entire pond	House	84	Forty-third	First	1874 [1]	117
Do					1889 [1]	642
Do					1893 [1]	877
Entrance at southeast corner of pond					1895 [2]	689
Do	House	[2] 132	Fifty-fifth	Second	1898 [1]	935
Channel dredged by the town and State.	do	[2] 60	Fifty-eighth	do	1904 [1]	967
Preliminary examination adverse to further expenditures by United States.	do	[1] 79	Sixty-first	First		

[1] No maps.
[2] Contains maps.

July 1, 1911, balance unexpended	$8,000.00
July 1, 1912, balance unexpended	8,000.00

(See Appendix C 12.)

13. Harbor of refuge at Block Island, R. I.—This island is about 14 miles east of the eastern end of Long Island and about 10 miles distant from the nearest point of the mainland.

Before the construction of the present harbor, Block Island had no harbor at all. The inner harbor is about 1,000 feet in its greatest dimension by about 800 feet at right angles to it; nearly two-thirds of this area has a depth of 10 feet at mean low water. The outer harbor is protected on the east side by a breakwater extending about 1,000 feet northward from the inner harbor. From the northwest to south the harbor is protected by the land. It is about 13 miles south by west from Point Judith harbor and about 25 miles southeasterly from Stonington Harbor, Conn.

Between 1870 and 1876, $285,000 was appropriated for a breakwater on the eastern side of the island for a harbor for medium-draft vessels, this work being completed in 1878. Between 1880 and 1882, $25,000 was appropriated for dredging an inner basin and the protection of the shore next to the breakwater, this work being completed in 1884. In 1884, $15,000 was appropriated for additions to the breakwater, this money being so spent and the work completed in 1884–85.

The project of 1884, as modified in 1888, provided for the construction of a harbor of refuge consisting of an inclosed inner harbor 800 feet square, protected by an L-shaped breakwater, for small vessels, and an exterior harbor for larger ones, protected by the original breakwater, at a total cost estimated in 1888 at $75,000. This project was practically completed in 1893.

The total expenditure prior to commencing work on the existing project was $400,575.17.

The existing project of June 3, 1896, is based on the report of a survey printed in House Document No. 83, Fifty-fourth Congress, first session, and provides for raising the entire breakwater to proper height and stopping sand leaks between certain points and dredging the main inner harbor to a depth of 10 feet, at an estimated cost of $83,985. This project has been completed, and the funds available are for maintenance, but have not been expended, pending the action of Congress on a project as proposed in House Document No. 828, Sixtieth Congress, first session.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
....	....	....	....	....	1868 [1]	786
Main breakwater and inner basin	Senate	Misc. 81	Fortieth	Second	1877 [1]	261
Enlarged inner harbor	do	[2] 27	Forty-eighth	do	1886 [2]	610
Shoal alongside of main breakwater.	....	....	....	....	1888 [2]	508
Repairs to breakwater and dredging to 10 feet.	House	[2] 83	Fifty-fourth	First	1896 [1]	678
Repairs to inner basin walls and dredging to 15 feet.	do	[2] 828	Sixtieth	do	....	....

[1] No maps.

[2] Contains maps.

Until the act of July 25, 1912, was passed no modification had been made in the existing project since its adoption beyond the removal of the portion of the north wall of the inner harbor lying between the entrance to the harbor and the main breakwater, as recommended on page 10, report of the Board of Engineers, printed in House Document No. 60, Fifty-eighth Congress, second session. The project under which work was prosecuted provided for raising the entire breakwater to proper height, stopping sand leaks between certain points, and dredging the main inner harbor to 10 feet depth at mean low water including the removal of the spur above referred to.

The river and harbor act approved July 25, 1912, adopted a project for additional improvement in accordance with report printed in House Document No. 828, Sixtieth Congress, first session, which contemplates straightening and rebuilding certain portions of the breakwater and in dredging the anchorage to a depth of 15 feet at mean low water, at an estimated cost of $132,000, and made an appropriation of $30,000 for the purpose.

No operations have been in progress during the past fiscal year. The expenditures were for contingencies and care of lights.

The sum of $130,644.06 had been expended on the existing project up to June 30, 1912, of which $30,455.14 was for maintenance.

By the expenditures made, the existing project had been completed, the entrance to the inner harbor which had shoaled up from the drift of sand had been partially dredged to a depth of 12 feet and redredged to a depth of 10 feet several times. The north wall of the inner harbor had been strengthened and repaired.

The improvement provides an anchorage area of about 17 acres, with a least depth of 10 feet at mean low water, 10 acres of which is within the walls of the inclosed inner harbor.

The mean rise and fall of the tide is about 3 feet.

The commerce of the harbor in 1911 amounted to 10,177 short tons, valued at $498,698.90, chiefly fish and general merchandise.

It is proposed to apply the available funds to maintaining the breakwater and for maintaining the depth in the protected area by dredging when necessary. The additional appropriation recommended for the fiscal year 1914 will be applied to work under the new project adopted by the act of July 25, 1912.

July 1, 1911, balance unexpended	$25,545.44
Received from sale of property	12.23
	25,557.67
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	373.50
July 1, 1912, balance unexpended	25,184.17
Amount appropriated by river and harbor act approved July 25, 1912	30,000.00
Amount available for fiscal year ending June 30, 1913	55,184.17
Amount (estimated) required to be appropriated for completion of existing project	[1] 102,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 50,000.00

(See Appendix C 13.)

14. *Great Salt Pond, Block Island, R. I.*—The Great Salt Pond is located about the center of Block Island and contains an anchorage area of 150 acres for vessels drawing 18 feet and over. The work of converting the pond into a harbor of refuge by making a channel through the beach on the west, connecting it with deep water in the ocean, was started by the State of Rhode Island and the town of New Shoreham. It is about 12½ miles southwesterly from Point Judith Harbor of refuge and 20 miles southeasterly from Stonington Harbor, Conn.

No project had been adopted prior to the existing one.

The existing project of June 3, 1896, based on the report of a survey printed in House Document No. 57, Fifty-fourth Congress, first session, as modified June 15, 1900 (Annual Report, Chief of Engineers, 1900, p. 1249), provided for a channel 600 feet wide to have a central depth of 25 feet for a width of 150 feet, sloping gradually to 12 feet in a width of 504 feet, the channel seaward to be protected on the south by a jetty extending to 350 feet beyond the original 18-foot contour and on the north by a jetty about 1,200 feet long, and the sides of the channel where it passed through the original beach to be protected by stone revetments and sand fences, at a total estimated cost of $305,000.

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[1] Exclusive of amount available for fiscal year 1913.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Great Salt Pond and Harbor on east side of island.					1868 [1]	785
Entrance to Great Salt Pond	House	[2]60(p. 11)	Fifty-eighth	Second	1904 [1]	958–959
Inner harbor, Great Salt Pond	do	[2] 318	Sixty-first	do		

The modification of the existing project in 1900 was only in the estimated cost of the work, so that the project as it now exists is the same as stated above.

No operations have been in progress during the past year. The expenditures were for office contingencies and repairs to the U. S. steam dredge *Gedney*.

Up to June 30, 1912, $208,035.63 had been expended by the General Government on the existing project, of which $18,998.98 had been used for maintenance and repair.

At the time the work commenced under the General Government a channel of varying width and depth had been dredged with the money appropriated by the State and town, which would permit of 12-foot draft being carried in. The south jetty had been built out 837 feet, and a north jetty 250 feet long had also been built, but at a distance of 720 feet from the south jetty instead of 600 feet. By the United States expenditures the south jetty had been extended 439 feet beyond the originally projected length, making a total of 1,691 feet from the initial point on shore. Some damage done by a severe storm in the spring of 1900 had been repaired. The 25-foot deep channel 150 feet wide had been completed, and a cut 23 feet deep and 30 feet wide had been made on either side of it, that on the northerly side of the channel going but about halfway through. The 18-foot depth had been dredged to a width of 300 feet. The present dimensions of the entrance channel appear to about maintain themselves.

The mean rise and fall of the tide is about 3 feet.

The commerce of this harbor in 1911 amounted to 8,736 short tons, valued at $626,929.40, chiefly of fish and general merchandise. During the summer season a large number of passengers are carried to Block Island through this harbor.

So far as known, no effect has been produced on freight rates by the improvement.

July 1, 1911, balance unexpended	$34,987.54
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	523.17
July 1, 1912, balance unexpended	34,464.37
Amount (estimated) required to be appropriated for completion of existing project	[3]75,000.00

(See Appendix C 14.)

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[1] No maps. [2] Contains maps. [3] Exclusive of the balance unexpended July 1, 1912.

15. Removing sunken vessels or craft obstructing or endangering navigation: Schooner "Ada Ames," schooner "A G. Cole," schooner "Mary Adelaide Randall," schooner Lois V. Chaples," schooner "Hannah F. Carleton," sloop "Tina B."

(*a*) Schooner *Ada Ames* was loaded with lime, sprung a leak, burned, and sunk in about 24 feet of water between Shovelful Light Vessel and Monomoy Point, Mass., and was reported as a dangerous obstruction to navigation June 6, 1911. Destruction and removal of wreck by hired labor and use of Government plant was authorized July 29, 1911. Removal was commenced August 7 and completed August 19, 1911.

(*b*) *Schooner "A. G. Cole."*—This wreckage was lying in from 8 to 10 feet of water about halfway between Monomoy Life-Saving Station and Monomoy Point Station and half a mile from shore. The wreckage consisted of a vessel's bottom 125 feet long and 30 feet wide, and was reported as a dangerous obstruction to navigation June 6, 1911. Destruction and removal of wreck by hired labor and use of Government plant was authorized July 29, 1911. This wreckage was removed in connection with the removal of the wreck of the schooner *Ada Ames*. The total cost of the removal of both wrecks was $596.25.

(*c*) Schooner *Mary Adelaide Randall*, loaded with coal, was wrecked on the west shore of Block Island, R. I., near the entrance to the Great Salt Pond, in December, 1911. Complaint was made April 5, 1912, that portions of the wreck had been washed into the entrance channel of the Great Salt Pond and formed a dangerous obstruction to navigation. Destruction and removal of the entire wreckage by contract was authorized April 16, 1912. After 30 days' advertisement bids were received May 24, 1912, and the contract for removal was awarded to the T. A. Scott Co. (Inc.), New London, Conn., the lowest bidder, for $645. Contract was entered into May 31, 1912, and the work of removal was ready to commence June 30, 1912, the close of the fiscal year.

(*d*) Schooner *Lois V. Chaples*, loaded with coal, sprang a leak in a gale of wind and sunk in Nantucket Sound about November 3, 1911, about 1⅝ miles W. ½ N., magnetic, from Handkerchief Shoal Light Vessel. Wreck to be removed in connection with the removal of the wreck of the *Hannah F. Carleton*.

(*e*) Schooner *Hannah F. Carleton*, loaded with anthracite coal, sank late in November or early in December, 1911, in Nantucket Sound about 1¼ miles NW. by W. ½ W., magnetic, from Handkerchief Shoal Light Vessel. The wrecks of the *Lois V. Chaples* and *Hannah F. Carleton* were both dangerous obstructions to navigation, but the winter being one of unusual severity with large fields of ice floating in the sound, their removal could not be accomplished until the weather conditions became more favorable. Then destruction and removal by contract was authorized May 10, 1912. Advertisement was issued inviting proposals for the removal of both vessels under one contract, June 7, to be opened July 9, 1912.

(*f*) Sloop *Tina B* was reported April 27, 1912, as sunk in from 5 to 14 feet of water on the edge of the channel leading to "Old Warwick Cove," at Oakland Beach, R. I., and forming an obstruction to navigation. Destruction and removal of the wreck by contract was authorized May 24, 1912. Advertisement was issued inviting proposals for the removal June 17, to be opened July 9, 1912.

(See Appendix C 15.)

EXAMINATION AND SURVEY REQUIRED BY THE RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

Reports dated November 16, 1909, and November 21, 1911, with maps, on preliminary examination and survey, respectively, of *Nantucket Sound, Mass.*, with a view to the removal of the northerly end of Stone Horse Shoal and of such portions of Bearse Shoal and Pollock Rip Shoal as may be necessary, required by the river and harbor act approved March 3, 1909, were duly submitted by the district officer and a special board of engineers. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 536, Sixty-second Congress, second session. A plan of improvement by the United States of the north or Pollock Rip Channel through the shoals lying near the entrance to Nantucket Sound, at an estimated cost of $250,000, is presented.

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and surveys required by the river and harbor act of June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated.

1. *Preliminary examination of Sakonnet Harbor, R. I.*—Report dated December 24, 1910, is printed in House Document No. 264, Sixty-second Congress, second session. The improvement of this harbor by the United States is not considered worthy of being undertaken at the present time.

2. *Preliminary examination, with plan and estimate of cost of improvement, of harbor at New Bedford and Fairhaven, Mass.*—Reports dated December 28, 1910, and April 21, 1911, with maps, are printed in House Document No. 442, Sixty-second Congress, second session. A plan of improvement, at an estimated cost of $56,610 for first construction, and $3,000 annually for maintenance, is presented.

PRELIMINARY EXAMINATION AND SURVEY REQUIRED BY THE RIVER AND HARBOR ACT OF FEBRUARY 27, 1911.

The district officer was also charged with the duty of making a preliminary examination and survey of *Providence River and Harbor, R. I., with a view to deepening the channel to 30 feet*, provided for in the river and harbor act of Feruary 27, 1911, and reports thereon will be duly submitted in time for consideration by Congress during its next session.

IMPROVEMENT OF RIVERS AND HARBORS IN THE NEW LONDON, CONN., DISTRICT.

This district was in the charge of Capt. A. E. Waldron, Corps of Engineers. Division engineer, Col. W. M. Black, Corps of Engineers.

1. *Pawcatuck River, R. I. and Conn.*—The Pawcatuck River has its source in the southwestern part of Rhode Island, being formed by the junction of the Wood and Charles Rivers, and empties into the easterly end of Little Narragansett Bay. Its total length is about 18 miles and its general direction of flow is westerly and southerly; the lower 9 miles of the river forms the boundary between the States of Rhode Island and Connecticut.

The tidal and navigable part of the river extends 5 miles from Westerly, R. I., to its outlet in Little Narragansett Bay, through the northern part of which a navigable channel extends 2½ miles to Stonington Harbor, Conn., through which Long Island Sound is reached.

Before improvement the channel of the river was crooked and obstructed by numerous shoals and rocks, on some of which there was but 1 to 1½ feet of water, and the greatest depth that could be carried through the bay channel was 4½ feet.

The original projects, that of 1871 for the river channel and that of 1879 for the channel across the bay, provided for depths of 5½ and 7 feet and widths of 75 and 200 feet, respectively. The expenditure on the original projects was $97,500.01.

The present project, adopted in 1896, provides for a channel 10 feet deep from Stonington, Conn., to Westerly, R. I., with a width of 200 feet from Stonington to Avondale, R. I., a distance of about 4 miles; a width of 100 feet from Avondale to the lower wharves at Westerly, a distance of about 3 miles, and a width of 40 feet between the upper and lower wharves of Westerly, a distance of about one-half mile, at a total estimated cost of $200,361.60. The river and harbor act of March 3, 1905, authorized the use of $1,000 of the appropriation for the improvement of the Pawcatuck River in the removal of obstructions at Watch Hill, at the southeastern part of Little Narragansett Bay. The greater portion of the obstructions was removed in January and February, 1906, at a cost of $865.82. The project has not been modified since its adoption.

For complete report with map upon which the project is based, see House Document No. 62, Fifty-fourth Congress, first session. The report, without map, was published in the Annual Report of the Chief of Engineers for 1896, pages 676–678.

During the fiscal year no work of improvement has been carried on. A careful survey of the channels was made, and bids were opened April 12, and a contract dated April 30 was entered into for dredging in the vicinity of Stantons Weir Point.

The amount expended on the project up to the close of the fiscal year ending June 30, 1912, was $78,578.53, of which $15,080.41 was applied to maintenance. The sum of $630.67 was received from the sale of the steamer *Castle*.

The project is about 30 per cent completed. A channel of project depth and 100 feet in width has been dredged through Little Narragansett Bay, about 10,400 feet in length; a channel of project dimensions, i. e. 10-foot depth and 100 feet in width, has been dredged from Avondale to the lower wharves at Westerly, a distance of about 14,000 feet, with the exception of a stretch in the vicinity of Stantons Weir Point about 1,800 feet long, now under contract; and a channel of project dimensions, i. e. 10 feet deep and 40 feet in width, has been dredged between the lower and upper wharves at Westerly, a distance of about 3,000 feet, to the head of navigation.

The maximum draft which could be carried June 30, 1912, was 10 feet in the bay channel, 8 feet in the river, and 6 feet near Watch Hill. The mean rise of tide is 2.6 feet at the mouth of the river and 2.3 feet at Westerly.

The reported tonnage for the calendar year 1911 amounted to 53,921 short tons, mainly coal, lumber, and paving blocks, valued at $285,005.

The effect of the improvement is to permit coal, lumber, and building material to be delivered in vessels at Westerly, and to ship therefrom paving blocks and granite in vessels instead of by rail, thus giving water competition for these materials, with a resulting benefit in the reduction of freight rates.

For the purpose of maintaining the project as at present completed or under contract, and for the removal of bowlders and ledge rock, the sum of $6,000 can be profitably expended in the fiscal year ending June 30, 1914.

July 1, 1911, balance unexpended	$14,965.70
Received from sale of steamer *Castle*	630.67
	15,596.37
June 30, 1912, amount expended during fiscal year, for works of improvement	544.24
July 1, 1912, balance unexpended	15,052.13
July 1, 1912, outstanding liabilities	51.45
July 1, 1912, balance available	15,000.68
July 1, 1912, amount covered by uncompleted contracts	10,600.00
Amount (estimated) required to be appropriated for completion of existing project	[1]121,811.35
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1]6,000.00

(See Appendix D 1.)

2. New London Harbor, Conn.—New London Harbor is located about 14 miles east of the mouth of the Connecticut River, and comprises the lower 3 miles of the Thames River. It has a navigable width of one-quarter to 1¼ miles and depth of 26 feet or more in the main channel from Long Island Sound to the railroad drawbridge which crosses the river above the New London dock front. This channel, especially opposite New London, follows the east bank. Between it and the city docks is a nearly level area having a general depth of 10 to 15 feet. Before improvement part of the docks were accessible to vessels of 16 to 18 feet draft at high tide only.

The original and present project for the main harbor, adopted by the act of June 13, 1902, provides for dredging and maintaining a ship channel 400 feet or more in width, 23 feet deep, and about 6,000 feet long. This channel leaves the deep water of the river opposite

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[1] Exclusive of the balance unexpended July 1, 1912.

Fort Trumbull on the west side, skirts the water front of the city, including that of Winthrop Cove, to the Central Vermont Railroad bridge and the east side of the Central Vermont Dock, and joins the natural deep channel at a distance of about 4,000 feet upstream from the point of beginning. The estimated cost of the improvement was $145,000, and $1,000 per annum for maintenance.

For complete report, with map, upon which the project is based, see House Document No. 392, Fifty-sixth Congress, first session. The report, without map, was published in the Annual Report of the Chief of Engineers for 1900, pages 1351–1357.

Under a modification of the existing Thames River project, adopted in 1892, Shaws Cove, a branch of New London Harbor, has been dredged to 12 feet, and the river and harbor act of June 25, 1910, further modified this project in accordance with report, without map, printed in House Document No. 329, Sixtieth Congress, first session, which provides for restoring the former project depth of 12 feet in Shaws Cove, New London Harbor, and for an increase in the depth to 15 feet at low water, at an estimated cost of $12,000, with $3,000 every 10 years for maintenance.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Winthrop Cove [1]	House	395	Fifty-eighth	Second	1904	1004–1008
Main entrance [1]	do	178	Fifty-ninth	do		

[1] No maps.

The existing project as modified by the act of June 25, 1910, provides for dredging and maintaining a ship channel 400 feet or more in width, 23 feet deep, and about 6,000 feet long in the main harbor. This channel leaves the deep water of the river opposite Fort Trumbull on the west side, skirts the water front of the city, including that of Winthrop Cove, to the Central Vermont Railroad bridge and the east side of the Central Vermont Dock, and joins the natural deep channel at a distance of about 4,000 feet upstream from the point of beginning; and for restoring Shaws Cove to its former project depth of 12 feet and deepening the same to 15 feet.

During the fiscal year no work of improvement has been carried on.

The amount expended on the project up to the close of the fiscal year ending June 30, 1912, was $141,434.85, of which $34.85 was applied to Shaws Cove. No maintenance work has been done on this project.

That portion of the project covering the main harbor has been completed, a channel having a depth of 23 feet and a general width of 400 feet having been dredged from deep water opposite Fort Trumbull, skirting the city water front, including Winthrop Cove, to the Central Vermont Railroad bridge and the east side of the Central Vermont Dock, and joining the natural channel at a distance of about 4,000 feet upstream from the point of beginning. No work under the existing project has been done in Shaws Cove.

The maximum draft which could be carried June 30, 1912, to opposite all the principal docks in the main harbor was 23 feet and in Shaws Cove 11.5 feet.

The mean range of tide is 2.6 feet.

The reported tonnage for the calendar year 1911 amounted to 816,980 short tons for the main harbor, mainly steamboat freight, coal, and lumber, and 24,133 short tons for Shaws Cove, mainly coal, lumber, and brick, having a total valuation of $78,323,083.10.

The effect of this improvement has been to materially reduce freight rates.

The available balance will be applied to maintenance and completion of project for Shaws Cove.

July 1, 1911, balance unexpended	$13,965.70
June 30, 1912, amount expended during fiscal year, for works of improvement	.55
July 1, 1912, balance unexpended	13,965.15

(See Appendix D 2.)

3. *Thames River, Conn.*—The Thames River is a tidal stream, 15 miles in length, having its source and head of navigation at the junction of the Shetucket and Yantic Rivers at Norwich, Conn. It flows in a southerly direction and empties into Long Island Sound at New London, the lower 3 miles constituting New London Harbor. Before improvement for 4 miles below Norwich the natural depths were 6 feet or more at low water, with widths of 400 to 1,000 feet. Below this point depths were 13 feet or more and widths 800 to 3,000 feet.

The original project, adopted in 1836, provided for a channel 11 feet deep at low water, to be secured by dredging and building dikes. On this project $40,300 had been expended when, in 1839, work was stopped, the project not having been completed.

The existing project, adopted June 23, 1866, and modified in 1879, 1882, 1888, 1892, 1907, and 1910, is to dredge and build training walls to secure a channel 200 feet wide, with depths of 20 feet, from New London to Allyns Point, and 14 feet thence, 5 miles, to Norwich; to dredge Shaws Cove at New London to a depth of 12 feet; and to remove rocks and other obstructions in Shetucket River at Norwich. Estimates of cost were $473,870 for construction and $9,500 annually for maintenance. By the act of June 25, 1910, the improvement of Shaws Cove was made part of the project for New London Harbor.

For complete reports upon which the existing project and modifications are based see Annual Report of the Chief of Engineers for 1866, Part IV, page 197; for 1879, page 332, without map; for 1882, pages 606–607, with map in two sheets; for 1888, page 523 (reference to report), without map; House Document No. 73, Fifty-first Congress, second session, published in Annual Report of the Chief of Engineers for 1891, page 833 et seq., without map; House Document No. 265, Fifty-ninth Congress, second session, with map; and House Document No. 397, Sixty-first Congress, second session, with map. For reference to examination of west channel from Poquetanuck drawbridge to Kitemaug, not a part of project, see House Document No. 260, Sixty-second Congress, second session, without map.

The project, as modified, provides for a channel 200 feet in width and of 20 foot depth up to Allyns Point; thence of the same width and 14 feet deep to the head of navigation at Norwich; the construction of five training walls, located, respectively, at Mohegan, Trading Cove, Long Rock, Rolling Mill, and Norwich, with their tops at mean high water; and the removal of rocks and other obstructions in the Shetucket River at Norwich.

During the fiscal year the obstructions in Shetucket River were removed under open market agreement at a cost of $1,500. An examination of the 14-foot channel from Allyns Point to Norwich disclosed several shoals, and under date of June 29, 1912, advertisements were issued for restoring and completing the channel to project dimensions.

The amount expended on the project (including Shaws Cove prior to June 25, 1910), up to the close of the fiscal year ending June 30, 1912, was $473,290.18, of which $33,446.99 was applied to maintenance. The sum of $504.54 was received from the sale of the steamer *Castle*.

The project has been completed, except that part of the channel between Allyns Point and Norwich is slightly deficient in width, a channel 200 feet in width and 20 feet in depth having been dredged at Barletts Crossover and the natural channel opposite Montville upper docks having been increased in width to 200 feet and 20 feet in depth; a channel 200 feet in width, except for about 2,000 feet in the vicinity of Waldens Island, where it has a width of 175 feet and 14 feet in depth, has been dredged from Allyns Point to Norwich; the five training walls have been completed, with the exception of the upper end of Rolling Mill dike, which has become unnecessary because of adjacent shore improvements; and the obstructions have been removed from Shetucket River.

The maximum draft which could be carried June 30, 1912, to Allyns Point was 20 feet; from thence to Norwich, 13 feet; and in the Shatucket River, 12 feet to the town dock.

The mean range of tide is 2.6 feet at New London and 3.1 feet at Norwich.

The reported tonnage for the calendar year 1911 amounted to 480,445 short tons, mainly coal, steamboat freight, and lumber, valued at $7,063,796.39.

The work done has reduced the cost of transportation by enabling freight to be brought in vessels of 16 and 22 foot draft instead of 8-foot draft. The river commerce of the present day could not be carried except for the increased depths thus obtained.

For the purpose of maintaining the improvement the repair of the three lower training walls, Mohegan, Trading Cove, and Long Rock, should be undertaken, and the amount which can be profitably expended for this work in the fiscal year ending June 30, 1914, is $12,000.

July 1, 1911, balance unexpended	$26,310.52
Received from sale of steamer *Castle*	504.54
	26,815.06
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	300.70

July 1, 1912, balance unexpended	$26,514.36
July 1, 1912, outstanding liabilities	1,504.40
July 1, 1912, balance available	25,009.96
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 12,000.00

(See Appendix D 3.)

4. Connecticut River between Hartford, Conn., and Holyoke, Mass.—The source of the Connecticut River is Connecticut Lake, in the extreme northerly portion of New Hampshire, from which it flows in a southerly direction between that State and Vermont, forming the boundary line between these two States, and through Massachusetts and Connecticut, emptying into Long Island Sound at Saybrook, about 30 miles to the eastward of New Haven and about 14 miles to the westward of New London. Its total length is about 345 miles and its entire watershed is 11,085 square miles. The section included in this heading is 34 miles long, extending from Hartford, 51.9 miles from the mouth of the river, to Holyoke, and is naturally divided into three distinct sections. From Hartford to the foot of Enfield Rapids, 10½ miles, the river has a gentle slope, with a sandy, shifting bottom; from the foot to the head of Enfield Rapids, 5½ miles, the total fall at low water is 32 feet, and the bed of the river is largely rock; from Enfield Falls to Holyoke, 18 miles, the river is of moderate width, gentle slope, fair depth, and stable bottom.

In its original condition the lower section had a navigable depth of 2 feet or less at low water; the second section could be navigated upstream only with great difficulty, and only by boats of shallow draft; the third section was navigable by boats drawing 4 to 5 feet of water.

At Enfield Rapids a canal with locks 80 feet in length and 18 feet in width, designed for boats with draft of about 3 feet at low water, has been constructed by private enterprise as part of a water-power development scheme.

Prior to June 30, 1898, $93,059.70 was expended in the construction of wing dams and dredging to provide a temporary improvement below Enfield Rapids and in extensive surveys and examinations, which were made with a view to permanent improvement of the whole stretch from Hartford to Holyoke.

No work of improvement has been carried on in this section of the river since 1886.

The river and harbor act of July 25, 1912, appropriated $25,000 for work of maintenance.

A complete history of the improvement of this section of the river up to that date, with maps and plans, is given in the Annual Report of the Chief of Engineers for 1878, pages 248–391.

Examinations and surveys with a view to future permanent improvement have been made under the river and harbor acts of June 3, 1896, June 13, 1902, March 3, 1905, March 2, 1907, and March 3, 1909. The reports are printed in House Documents No. 136, Fifty-fifth Congress, second session; No. 231, Fifty-eighth Congress, third session; No. 323, Fifty-ninth Congress, second session; No. 1311, Sixtieth Congress, second session; and No. 818, Sixty-first Congress, second session, respectively.

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[1] Exclusive of the balance unexpended July 1, 1912.

After considering the data obtained in all the foregoing surveys, the Board of Engineers for Rivers and Harbors, in report dated March 14, 1910 (printed in H. Doc. No. 818, 61st Cong., 2d sess.), recommended the adoption of the plan presented in Document No. 323, Fifty-ninth Congress, second session, at an estimated cost of $1,015,600, with $10,000 annually for maintenance, under the following conditions:

That a suitable lock and dam for surmounting the Enfield Rapids be constructed by private or corporate interests, free of cost to the United States.

That navigation through said lock shall be free from any toll or charge.

That those constructing the lock and dam assume all responsibility for claims for damages that may arise from flowage rights, from injury to water power, or from any other source.

That after construction the lock shall become the property of the United States and shall be maintained and operated at the expense of the Federal Government.

No operations were conducted by the United States during the fiscal year. The expenditure made was in connection with an inspection of the river.

The amount expended on the survey authorized by the acts of June 13, 1902, and March 3, 1905, was $22,838.47, and the amount expended from the appropriation of March 2, 1907, up to June 30, 1912, was $402.

No permanent benefit has resulted from the work thus far done.

SURVEY.

July 1, 1911, balance unexpended	$4,918.27
June 30, 1912, amount expended during fiscal year, for works of improvement	5.00
July 1, 1912, balance unexpended	4,913.27

MAINTENANCE.

Amount appropriated by river and harbor act approved July 25, 1912	25,000.00
Amount available for fiscal year ending June 30, 1913	25,000.00

(See Appendix D 4.)

5. *Connecticut River below Hartford, Conn.*—The source of the Connecticut River is Connecticut Lake, in the extreme northerly portion of New Hampshire. It flows in a southerly direction between that State and Vermont, forming the boundary line between these two States, and through Massachusetts and Connecticut, emptying into Long Island Sound at Saybrook, about 30 miles to the eastward of New Haven and about 14 miles to the westward of New London. Its total length is about 345 miles, and its entire watershed is 11,085 square miles. The section included in this project is 51.9 miles long and extends from Hartford to Long Island Sound. Before beginning improvement the available depth over Saybrook Bar at the mouth of the river was 7 feet at mean low water; thence to Hartford the available depth over the shoalest of the river bars was about 5 feet at low water, being generally at its minimum after the spring freshets and increasing as the period of summer low water continued.

The original project, adopted in 1836, provided for the removal of the Saybrook Bar by dredging. Up to 1843 an 11 to 12 foot channel had been dredged 50 feet wide and 1,500 feet long, at a cost of $23,471.57. No further work was done until 1870, by which time the dredged channel had been nearly obliterated by storms and freshets.

A project for permanent improvement was adopted in 1870 and modified in 1873 and 1880, under which two jetties were built at Saybrook Bar and dikes constructed at Hartford and Glastonbury Bars.

In 1887 a project was adopted and modified in 1890, which provided for maintaining the navigable channel by completing two jetties at Saybrook Bar to a height of 5 feet above high water, with top width of 6 feet and side slopes of 1 on 1; raising the training wall, nearly 3,700 feet long, at the Hartford Bars as might be found necessary by experience, but not to exceed 15 feet above low water; dredging the channel between the jetties at the mouth of the river to depth of 12 feet and width of 400 feet, and maintaining the channel in the river by annual dredging at the various bars to about 10 feet depth at mean low water and to a width as near 100 feet as practicable, at an estimated cost of $130,000, and $10,000 annually for dredging for maintenance.

For scope and history of the modifications see pages 120 and 121, Annual Report of the Chief of Engineers for 1900.

The act of June 13, 1902, authorized an expenditure of $1,000 for removal of obstructions at mouth of Salmon River, a tributary to the Connecticut River.

Up to the time of the adoption of the present project $625,910.50 had been expended on this improvement, of which $362,007.78 had been applied to maintenance.

Under previous projects the maintenance of river-bar channels by annual dredging has been held paramount, and under the project of 1887, as modified in 1890, a channel 200 feet wide and 12 feet deep at mean low water, which was dredged through Saybrook Bar between the jetties, has been well maintained by the jetties, and annual dredging at the river bars has generally kept a channel about 50 feet wide open, so that Hartford-New York steamers and barges drawing from 9 to 11 feet, according to the river stage, have been but little detained, and then only at summer low river and before completion of the annual dredging.

The river and harbor act of February 27, 1911, adopted the project printed in House Document No. 1294, Sixty-first Congress, third session, and appropriated $77,000 for the work, and authorized the Secretary of War to enter into contracts for the completion of the project to the extent of $100,000 in addition to the amount appropriated. The project named in the House document above referred to provided for a channel 12 feet deep and 100 feet wide at mean low water (2 feet on the Hartford gauge) from Hartford to the bar at the mouth of the river and for a channel across the bar 300 feet wide and 15 feet deep at mean low water, the channels to be obtained by dredging and the construction of dikes, training walls, and revetments at an estimated cost as follows:

Channel in the river: Dredging 250,000 cubic yards, at 11 cents	$27,500
Bar at mouth of river: Dredging 165,000 cubic yards, at 20 cents	33,000
Dikes, training walls, and revetments	100,000
Total	160,500
Superintendence, contingencies, etc	16,500
Total	177,000

and $15,000 per annum for maintenance until such time as dikes and training walls are completed, and $7,000 per annum for maintenance thereafter. The project also provides for the maintenance of the jetties at the mouth of the river. This project has not been modified since its adoption.

For complete report on the survey authorized by the act approved March 3, 1909, and on which the present project is based, see House Document No. 1294, Sixty-first Congress, third session. Maps of this survey are not published. The river from the Sound to Hartford is shown on Coast Survey Charts Nos. 252–256.

During the fiscal year the river-bar channels have been kept open for navigation by maintenance dredging and snagging; a channel 300 feet wide and 15 feet deep across the bar at the mouth was begun; a new channel was dredged at Dividend Bar to full project dimensions, and the dikes, revetments, etc., authorized by the existing project were designed and located and a subproject approved for the construction of these works.

The amount expended on this project up to the close of the fiscal year ending June 30, 1912, was $25,010.45, of which $11,195.28 was applied to maintenance. The sum of $840.90 was received from the sale of the steamer *Castle*.

The completion of this project is to be accomplished under continuing contract appropriations, and the balance of the authorization remaining to be appropriated is $60,000.

The proportion of the existing project accomplished up to June 30, 1912, is about 3 per cent, disregarding work done for maintenance. Sufficient work has not yet been done on the permanent improvements under this project to be of any material benefit to commerce, but the maintenance of the river bar channels has been of the greatest benefit to commerce, which could not be carried in anything like its present volume without this work.

The maximum draft which could be carried at mean low water over the shoalest river bar on June 30, 1912, was about 10 feet. The mean rise of tide is 3.4 feet at Saybrook jetties, and, on low river, 1.2 feet at Hartford. The average annual variation in the height of the river at Hartford is at least 16 feet and the maximum 6 or 7 feet more. This variation decreases rapidly from Hartford toward the mouth, where the annual variation is due to the rise and fall of tide, which probably rarely exceeds 5 feet. The length of the river under improvement from the mouth to Hartford is 51.9 miles.

The reported tonnage for the calendar year 1911 amounted to 683,326 short tons, mainly coal, lumber, building materials, fertilizer, petroleum products, and miscellaneous steamboat freight, valued at $23,537,837.81.

The work done has reduced freight rates to Hartford and lower river ports materially, and has also greatly facilitated the delivery of coal and other freight. Without the improvements there could be but little freight traffic on the river.

The available balance and future appropriations will be applied to the maintenance of the river bar channels, to completion of the channel at the mouth of the river, and to the construction of dikes, training walls, and revetments authorized by the project. The additional work proposed is necessary to make the improvement available.

July 1, 1911, balance unexpended		$107,163.56
Received from sale of steamer *Castle*		840.90
		108,004.46
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$13,815.17	
For maintenance of improvement	9,570.91	
		23,386.08
July 1, 1912, balance unexpended		84,618.38
July 1, 1912, outstanding liabilities		3,368.40
July 1, 1912, balance available		81,249.98
Amount appropriated by sundry civil act approved Aug. 24, 1912		40,000.00
Amount available for fiscal year ending June 30, 1913		121,249.98
July 1, 1912, amount covered by uncompleted contracts		23,570.82
Amount of continuing contract authorization, act of Feb. 27, 1911		100,000.00
Amount appropriated under such authorization		40,000.00
Amount yet to be appropriated		60,000 00
Amount (estimated) required to be appropriated for completion of existing project		[1]60,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914:		
For works of improvement		60,000.00
For maintenance of improvement		15,000.00
Total		[1]75,000.00

(See Appendix D 5.)

6. *Eightmile River, Conn.*—Eightmile River rises in Shaw Lake, in the extreme easterly portion of Middlesex County, flows in a general southerly and slightly westerly direction and empties into the Connecticut River at Hamburg Cove, just above Essex, and about 8.7 miles above the mouth of the Connecticut River at Saybrook Point.

For a distance of about 1,900 feet from its mouth a natural channel, for the most part 50 to 90 feet wide and 8 to 12 feet deep at low water, existed to Hamburg Cove, and in the cove depths of from 15 to 25 feet. At the inner end of the cove a narrow channel, much obstructed by shoals, extended to the town of Hamburg, a distance of about seven-eighths of a mile. The length of the river under improvement, from the mouth to the head of the turning basin, is 1.53 miles; its total length is about 11 miles.

The first and existing project was adopted by the river and harbor act of June 25, 1910, and provides for securing a channel having a depth of 8 feet and a width of 75 feet from deep water in the Connecticut River to Hamburg, with a small turning basin at the inner end of the channel, in accordance with plan printed in House Document No. 327, Sixtieth Congress, first session. The estimated cost of completing the project was $9,000. No modification of the existing project has been made since its adoption.

For report on the survey of this harbor, made in compliance with the requirements of the act of March 2, 1907, see House Document No. 327, Sixtieth Congress, first session, in which is published a map of the river.

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[1] Exclusive of amount available for fiscal year 1913.

At the beginning of the fiscal year the channel had been completed, but slight deficiencies in depth existed in the turning basin at the head of the channel, due to the presence of large and unexpected bowlders. During the year the worst of these bowlders were removed, but available funds were insufficient to entirely complete the removal of bowlders from the turning basin.

Up to June 30, 1912, $9,000 had been expended on this project, all applied toward its completion.

The project is approximately 90 per cent completed. The work done has rendered it possible to ship lumber, ties, etc., from Hamburg in vessels of considerable size, heretofore practically impossible. The maximum draft that could be carried June 30, 1912, to the head of the improved channel was 8 feet. The head of navigation for vessels of any size is the turning basin at the head of the dredged channel, 1.53 miles above the mouth of the river.

The commerce of this waterway is mainly shipments of native lumber and railroad ties, and receipts of building material, miscellaneous freight and a small amount of coal. The tonnage reported for the calendar year 1911 amounted to 1,479 short tons, valued at about $21,526. At present it is impracticable to make any estimate of the effect of the project on freight rates.

It is not believed to be profitable to expend any further funds on the movement of this waterway, other than necessary maintenance.

July 1, 1911, balance unexpended	$3,034.78
June 30, 1912, amount expended during fiscal year, for works of improvement	3,034.78

(See Appendix D 6.)

7. *Harbor of refuge at Duck Island Harbor, Conn.*—Duck Island Harbor is a small bay on the north shore of Long Island Sound, about 7 miles west of the mouth of the Connecticut River and approximately midway between the harbors of New London and New Haven, being about 23 miles distant from each. The distance from Kelseys Point, on the west side of Duck Island Harbor, to Menunketesuck Point, on the east side, is abut 2½ miles, and the distance from the straight line joining these two points to the high-water line in the middle of the harbor is very nearly seven-eighths of a mile. Duck Island, which lies just outside of the straight line joining the two points named above, has a width, east and west, of about 250 feet, and a length, north and south, of about 800 feet. The mean rise of tide is 3.8 feet.

In its original condition practically no shelter was afforded by this harbor in winds from the east around through the south to the west. Good protection was afforded from all winds coming from the north. The bay afforded good anchorage depths.

The original project for this improvement, which was adopted by the act of September 19, 1890, provided for the construction of three riprap breakwaters of 3,000, 1,750, and 1,130 feet in length, respectively, inclosing and sheltering an area of about 115 acres with two entrances. The projected height of the breakwaters was 10 feet above low water; width on top, 10 feet; slopes, 2 on 3 on the outside and 1 on 1 on the inside. The estimated aggregate cost was $463,540. Under this project $120,202 was expended to June 30, 1910, of which $5,334.10 was for maintenance, and 2,697 linear feet of the longest breakwater had been built, but with reduced cross section, this breakwater extending westwardly from Duck Island to a low-water depth of 17 feet.

The river and harbor act of June 25, 1910, authorized the following changes, in accordance with plan printed in House Document No. 398, Sixtieth Congress, first session: The omission of two of the breakwaters originally planned to partially close the entrance between Duck Island and Menunketesuck Point; the omission of the additional length originally planned for the breakwater extending westwardly from Duck Island; the construction of a breakwater extending northwardly from Duck Island, a distance of about 1,100 feet; and the construction of a breakwater extending southwardly from Stone Island, just south of Kelseys Point, a distance of 3,750 feet; the three breakwaters to be 8 feet wide on top, 9 feet high above mean low water, with side slopes of 2 on 3 except on the northerly side of the breakwater, extending westwardly from Duck Island, and the westerly side of the breakwater, extending northwardly from Duck Island, where the slopes would be 1 on 1. The estimated cost of completing the modified project at the time of its adoption was $350,000, with $5,000 once in 10 years for maintenance.

For report on examination and map on which the original project was based, see Annual Report of the Chief of Engineers for 1887, Part I, page 641, and for report and map on which the modification authorized by the act of June 25, 1910, was based, see House Document No. 398, Sixtieth Congress, first session, and for report on preliminary examination made under the act of August 2, 1882, see Annual Report of the Chief of Engineers, 1884, Part I, page 684; also Senate Document No. 50, Forty-eighth Congress, first session.

The existing project, modified as stated above, now provides for the construction of three riprap breakwaters, viz, a breakwater extending northwardly from Duck Island a distance of 1,100 feet; a breakwater extending westwardly from Duck Island 2,697 feet; and a breakwater extending southwardly from Stone Island, just south of Kelseys Point, a distance of 3,750 feet; the three breakwaters to be 8 feet wide on top, 9 feet high above mean low water, with side slopes of 2 on 3, except on the northerly side of the breakwater extending westwardly from Duck Island and the westerly side of the breakwater extending northwardly from Duck Island, where the slopes are to be 1 on 1.

During the fiscal year the Kelsey Point Breakwater was completed for a distance of 1,660 feet from its inshore end, and an additional section 200 feet long was partially completed, being under construction at the close of the year; the breakwater northerly from Duck Island was very nearly completed for a distance of 600 feet northerly from Duck Island, and the remainder of its length was built to about high-water level, being under construction at the close of the year.

The amount expended to June 30, 1912, on the project authorized by the river and harbor act of June 25, 1910, was $79,306.46, all applied to work of improvement. The sum of $1,009.08 was received from the sale of the steamer *Castle*.

Work on this project is in progress under continuing contract appropriations. The river and harbor act of February 27, 1911, made an appropriation of $100,000 and authorized continuing contracts in the further sum of $190,000 for completion of the project, of which $140,000 remains to be appropriated.

The entire project, as modified by the act of June 25, 1910, is 52.5 per cent completed.

The commerce to be benefited by this improvement is the passing commerce of Long Island Sound, which may find it necessary or convenient to seek shelter in this locality, but the value of this commerce can not be satisfactorily estimated. During the fiscal year ending June 30, 1912, 1,121 vessels were reported as having anchored in this harbor, which in its present condition affords a very small percentage of the shelter which it will afford when completed, but even in its present condition it has resulted in the saving of many lives and of much property.

It is not practicable at present to state the effect of this project on freight rates, but the completed project will greatly enhance the safety of passing vessels in this portion of the Sound, and hence should tend to reduce freight rates.

The available balance and the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied to the completion of the project. The additional work proposed is necessary in order to furnish the desired protection and make the full measure of the improvement available.

July 1, 1911, balance unexpended	$137, 802. 37
Received from sale of steamer *Castle*	1, 009. 08
	138, 811. 45
June 30, 1912, amount expended during fiscal year, for works of improvement	57, 108. 83
July 1, 1912, balance unexpended	81, 702. 62
July 1, 1912, outstanding liabilities	12, 713. 93
July 1, 1912, balance available	68, 988. 69
Amount appropriated by sundry civil act approved Aug. 24, 1912	50, 000. 00
Amount available for fiscal year ending June 30, 1913	118, 988. 69
July 1, 1912, amount covered by uncompleted contracts	169, 525. 07
Amount of continuing contract authorization, act of Feb. 27, 1911	190, 000. 00
Amount appropriated under such authorization	50, 000. 00
Amount yet to be appropriated	140, 000. 00
Amount (estimated) required to be appropriated for completion of existing project	[1]140, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1]140, 000. 00

(See Appendix D 7.)

8. Branford Harbor, Conn.—Branford Harbor is about 5 miles to the eastward of New Haven Harbor. It consists of three distinct parts: The outer harbor, approximately 1 mile wide and three-quarters of a mile deep; the inner harbor, about half a mile in diameter, separated from the outer harbor by a series of rocks, the principal ones of which are known as "The Mermaids"; and the river, which empties into the inner harbor from the northeast. The natural low-water depths when improvement began were: At the outside of the outer harbor, 15 to 16 feet, gradually shoaling to 8 feet near "The Mermaids"; through the inner harbor from "The Mermaids" to the mouth of the river, 7 to 8 feet; up the river for a distance of 1 mile, nearly to the lower docks, 12 feet or more. From the lower to the upper docks, about one-half mile, the channel gradually shoaled and narrowed so that the controlling depth was less than 6 feet and the width 25 to 50 feet. At the upper dock the stream is crossed by an earthen causeway, in which there is a small drawbridge which is rarely opened, although the stream is navigable for small craft to a fixed bridge about one-half mile above. Since the adoption of the present project a very general and uniform shoaling of 1 to 2 feet has taken place in the inner harbor, so that the controlling depth between "The Mermaids" and the mouth of the river, the shoalest place in the channel, was only about 6 feet.

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[1] Exclusive of amount available for fiscal year 1913.

The original project, printed in House Document No. 100, Fifty-sixth Congress, second session, was adopted by the act of June 13, 1902, and provided for the dredging and maintenance of a channel 100 feet wide and 8½ feet deep at mean low water in the upper part of the river, between the lower and upper docks, at a cost of $5,000 and $250 annually for maintenance. The act approved March 2, 1907, appropriated $5,000 for this harbor and authorized the Secretary of War to continue the channel with the dimensions previously authorized for the inner harbor through the shoals at its outer end to deep water in the outer channel. The existing project is therefore the original project as thus modified, and provides for an 8½-foot channel 100 feet wide in the upper part of the river, between the lower and upper docks and through the shoals at the mouth of the river, at an estimated first cost of $13,000.

For report, without map, of survey upon which the present project is based, see Annual Report of the Chief of Engineers, 1901, page 1188 et seq.; for report, without map, on examination and survey made under a provision of the act of August 2, 1882, see Annual Report of the Chief of Engineers, 1884, pages 678–681; and for report on preliminary examination made in pursuance of act of March 2, 1907, see House Document No. 80, Sixtieth Congress, first session.

The amount expended during the fiscal year was in connection with the inspection of authorized private improvements and apportionment of office expenses.

The amount expended on the above-named project up to June 30, 1912, was $11,456.74, of which $1,919.29 was for maintenance.

The project was completed July 30, 1907, at which time channels of full project dimensions had been dredged from the 8½-foot curve in the lower harbor through the inner harbor to the mouth of the river, and in the river from a short distance below the lower docks upstream to the upper docks. The work done has greatly facilitated navigation and vessels of deeper draft now enter this harbor than was formerly possible.

Owing to shoaling which has taken place since the project was completed, the maximum draft that could be carried June 30, 1912, from the entrance of the harbor to the head of the improved channel was about 6½ feet at mean low water in the inner harbor and 7 feet in the river. The mean rise of tide is about 6 feet.

The actual length of channel under improvement in the inner harbor is about one-half of a mile and in the upper portion of the river six-tenths of a mile, but the total length of waterway from the outer end of the improved channel in the inner harbor to its upper end at Branford is about 2¼ miles. Above the head of the improved channel the river is navigable for small, light-draft pleasure craft one-half mile or more farther.

The commerce of this harbor is mainly in coal, iron, sand, clay, and lumber. The tonnage reported for 1911 amounted to 41,744 short tons, valued at $237,899.08. The amount of commerce in this harbor has greatly increased since the improvement was completed, particularly in the amount of iron, which was formerly handled by rail. The precise effect of the project on freight rates is unknown, but judging from the increased amount of commerce, particularly in certain commodities, the rates have decreased.

The available balance and future appropriations will be applied to the restoration of the existing channels to full project dimensions, which is greatly needed, and to the maintenance of the improvement.

July 1, 1911, balance unexpended	$3,628.37
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	85.11
July 1, 1912, balance unexpended	3,543.26
Amount appropriated by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	6,543.26

(See Appendix D 8.)

9. *New Haven Harbor, including West River, Conn.*—New Haven Harbor is about 71 miles easterly from the Battery, New York City, and about 45 miles westerly from New London, Conn. It is formed by a bay on the north side of Long Island Sound, which extends inland about 4 miles and is from 1 to 4 miles wide. Mill and Quinnipiac Rivers, navigable for about 1 and 3 miles, respectively, above their mouths, empty into the head of the harbor from the northeast. The original available low-water depth from the wharves to Cranes Bar, one-third way down the harbor, was 9 feet; thence to Fort Hale, halfway down, it was 16 feet or over. Below Fort Hale was a broad bar of soft mud extending across the channel, with available depth of 13 feet. The harbor entrance was partly obstructed by several sunken rocks. In Quinnipiac River the available low-water depth was about 4 feet, and in the west branch of Mill River about 5 feet to the head of the present projected improvement. Above this point both rivers are for the most part available for navigation only at high tide. The entire east branch of Mill River ran nearly bare at low tide.

In 1870 a project was adopted for removal of sunken rocks at the harbor entrance. This work was not continued after 1875, when the harbor breakwaters were first proposed. In 1871 the project was extended to include deepening the harbor channel, the proposed depth and width being modified from time to time as appropriations were made until 1899, when the project provided for a channel 16 feet deep and from 400 to 700 feet wide from Long Island Sound to the head of the harbor and for a dike to contract the channel across Fort Hale Bar, at a total estimated cost from beginning of $348,000. This project was nearly completed, the deficiencies being in the length of channel arm of the dike, which was about two-thirds the projected length, and in the width of the channel across Fort Hale Bar, which was only 200 feet wide. The total amount expended on these projects was $325,695.66.

The project adopted by the act of March 3, 1899, is in accordance with plan printed in House Document No. 82, Fifty-fifth Congress, first session, and provided for a channel 20 feet deep, 400 feet wide, and 4 miles long from Long Island Sound to Canal Dock; thence of same depth, 300 feet wide, one-half mile to Tomlinson Bridge; three anchorage basins below Tomlinson Bridge of 20, 16, and 12 feet depths; a channel up Quinnipiac River 200 feet wide and 12 feet deep to Grand Avenue; and a channel up Mill River 12 feet deep and 200 feet wide to the junction of the two branches above Chapel Street, and thence 12 feet deep and 75 feet wide up each branch to Grand Avenue. The act of March 3, 1899, making the first appropriation for this project, limited it to the portion below Tomlinson Bridge, but the act of June 13, 1902, authorized the extension to the part above Tomlinson Bridge, provided the cost should not exceed $345,000, the amount authorized by the act of 1899. The above project, including the improvement of Quinnipiac and Mill Rivers, except that part of Quinnipiac River between Ferry Street and Grand Avenue, was completed April 26, 1904, mainly under continuing contract, and a channel 8 feet deep and 50 feet wide was dredged in Quinnipiac River between Ferry Street and Grand Avenue. Before work was begun on the portion of Quinnipiac River between Ferry Street and Grand Avenue protests were received from property owners on that section of the river, mostly oystermen, to the effect that the channel was not needed and that the dredging of it would injure their oyster grounds. The matter was investigated and a report submitted to the Chief of Engineers, with the recommendation that in lieu of the proposed channel two short channels 8 feet deep and 50 feet wide be dredged, making available a natural channel up along the east side of the river in which the existing depth was 6 feet or more. This recommendation was approved and the channels were dredged.

The total amount appropriated for the project adopted by the act of 1899, exclusive of maintenance, amounts to $280,073.90, being less than the authorized cost of the project by $64,926.10.

West River lies between the city of New Haven and the town of West Haven. The head of navigation is at a fixed railroad bridge about one-half mile upstream from Kimberly Avenue Drawbridge. About 500 yards below this latter bridge the river widens into a shallow bay and joins New Haven Harbor south of Oyster or City Point. The natural channel, about 2,000 yards long through the middle of the bar, carried less than 3 feet at its shoalest part. A channel leading from the harbor to docks at Oyster Point had a controlling depth of 4.5 feet, but between Oyster Point and the channel along the West Haven docks was a wide flat nearly bare at low tide.

The project adopted by the river and harbor act of March 3, 1905, for improvement of West River, provided for a 9-foot channel, 100 feet wide, from the downstream corner of the 16-foot anchorage basin of New Haven Harbor, via Oyster Point and the dock frontage of West Haven, to Kimberly Avenue Bridge, at a cost of $38,500, and $500 for annual maintenance.

The river and harbor act of March 2, 1907, consolidated the improvement of West River with that of the main harbor, of which the former is a branch.

The river and harbor act of June 25, 1910, modified the project in accordance with report printed in House Document No. 1159, Sixtieth Congress, second session, so as to provide for deepening the 12-foot anchorage basin to 15 feet, dredging a channel 100 feet wide and 12 feet deep from the 12-foot anchorage basin toward Brewery Street about 1,500 feet, and the removal of certain obstructive rocks in Morris Cove, at an estimated cost of $68,000, which amount was appropriated by the act.

The river and harbor act of July 25, 1912, modified the project in accordance with report printed in House Document No. 26, Sixty-second Congress, first session, so as to provide for widening the east and west branch channels in Mill River from the point of bifurcation northerly to Grand Avenue, the east branch channel to width of 100 feet and the west branch channel to general width of 125 feet, increased to 150 feet at the turn and decreased to 75 feet at the head; also for a channel 8 feet deep and 75 to 100 feet wide in the Quinnipiac River between Ferry Street and Grand Avenue, all as shown on accompanying maps, and at a total estimated cost of $19,200. This act still further modified the project in accordance with report printed in House Document No. 535, Sixty-second Congress, second session, so as to provide for deepening the West River channel to 12 feet and providing additional width of from 25 to 50 feet at the turns and along the West Haven water front; also for extending this channel with depth of 12 feet and prevailing width of 75 feet from the Kimberly Avenue Bridge upstream approximately to the bridge of the New York, New Haven & Hartford Railroad Co.; also for dredging an anchorage basin 6 feet deep opposite Maher's dock and to the southward of the channel, all as shown on accompanying map, and at an estimated cost of $50,000 and $4,000 annually for maintenance. This act appropriated $19,200 for the first-named improvement and $54,000 for the second, being the estimated cost and maintenance for one year.

For report of survey and map upon which the project of 1899 was based see House Document No. 82, Fifty-fifth Congress, first session, also Annual Report of the Chief of Engineers, 1897, page 974. For report of examination and map on which the project for the first improvement of the West River channel was based see House Document No. 73, Fifty-eighth Congress, second session; also Annual Report of the Chief of Engineers, 1904, page 996. For report of survey and maps on which the modification of 1910 was based see House Document No. 1159, Sixtieth Congress, second session. For report of survey and maps on which the modifications of 1912 are based see House Documents No. 26, Sixty-second Congress, first session, and No. 535, Sixty-second Congress, second session. For published maps of the entire harbor see Annual Report of the Chief of Engineers for 1896, page 702, and 1911, page 1232.

The existing project is the project of 1899 modified and extended as above, and now provides for a channel 20 feet deep, 400 feet wide, and 4 miles long from Long Island Sound to Canal Dock; thence of same depth, 300 feet wide, one-half mile to Tomlinson Bridge;

three anchorage basins below Tomlinson Bridge of 20, 16, and 15 foot depths; a channel 100 feet wide and 12 feet deep from the 15-foot anchorage basin toward Brewery Street, about 1,500 feet; a channel 12 feet deep and from 100 to 150 feet wide from the downstream corner of the 16-foot anchorage basin via Oyster Point to the dock frontage of West Haven to Kimberly Avenue Bridge, thence of same depth and controlling width of 75 feet, about 2,300 feet, to the bridge of the New York, New Haven & Hartford Railroad Co. across West River; a 6-foot anchorage basin on the south side of the West River channel opposite Maher's dock; a channel up Quinnipiac River, 200 feet wide and 12 feet deep, to Ferry Street, thence 8 feet deep and from 50 to 100 feet wide between Ferry Street and Grand Avenue; a channel up Mill River, 12 feet deep and 200 feet wide, to the junction of the two branches above Chapel Street, and thence 12 feet deep and 100 feet wide up the east branch and the same depth and for the most part 125 feet wide up the west branch to Grand Avenue; the removal of certain obstructive rocks in Morris Cove.

During the fiscal year the deepening of the 12-foot basin to 15 feet was completed, and the main channel from Tomlinson Bridge westerly and southerly to the upper end of the 20-foot anchorage basin was redredged and restored to practically full project dimensions.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $416,977.51, of which $94,220.98 was for maintenance. Of the amount reported expended on existing project, $38,500 was expended on West River prior to its consolidation with the general project. The sum of $420.45 was received from the sale of the steamer *Castle*.

The existing project, as stated above, is about 90 per cent completed. The only portion remaining to be done is that portion of the project adopted by the act of July 25, 1912, viz, widening and deepening the West River channel and extending it to the railroad bridge, dredging the 6-foot anchorage basin, widening the Mill River channels above Chapel Street, and dredging the 8-foot channel in the Quinnipiac River between Ferry Street and Grand Avenue, uniting the two short channels already dredged there.

The work done has enabled deeper draft vessels to use the harbor than was formerly possible, with the resulting reduction of freight rates due to the larger vessels and increased facilities for handling freight made possible thereby. The West River Channel has greatly facilitated the oyster business at Oyster Point, which could not be carried on to its present extent without this channel; and the 12-foot channel northerly toward Brewery Street has made this portion of the harbor available for much deeper draft vessels than were formerly used.

The maximum draft which could be carried June 30, 1912, through the main channel to Tomlinson Bridge was about 20 feet at mean low tide; above Tomlinson Bridge the maximum low-water draft which could be carried up Mill River to Grand Avenue Bridge was 12 feet in both branches; up Quinnipiac River to Ferry Street Bridge 12 feet, and from Ferry Street Bridge to Grand Avenue a little more than 6 feet; up West River to the railroad bridge 7 feet, and through the 12-foot channel to Brewery Street 12 feet.

The mean rise and fall of tide in the main harbor, as determined with self-recording gauges, covering the period of a full year, is 6 feet. The maximum rise and fall is about twice this amount.

The total length of the channels under improvement is as follows: Main harbor from outer end to Tomlinson Bridge, 4.2 miles; 12-foot channel from 15-foot basin to Brewery Street, three-tenths of a mile; West River from the 16-foot anchorage basin to the railroad bridge, 1.9 miles; above Tomlinson Bridge in Mill River to point of bifurcation above Chapel Street, thirty-six one-hundredths of a mile, and from this point to Grand Avenue one-fourth of a mile in the east branch and thirty-four one-hundredths of a mile in the west branch; in the Quinnipiac River from Tomlinson Bridge to Grand Avenue, 1.3 miles. Above the head of the improved channel in West River this waterway is navigable for about a mile by small unmasted craft of light draft. Above the head of the improved channels in Mill River at Grand Avenue the stream is navigable by unmasted craft of light draft for about 2 miles farther, and above the head of the improved channel in the Quinnipiac River at Grand Avenue the stream is navigable for about one-fourth of a mile by lightly laden coal barges at high tide, and above this point for three-fourths of a mile, to Lewis Bridge, it is considerably used by small oyster craft; above Lewis Bridge the stream is navigable for small unmasted craft for several miles farther.

The commerce of New Haven Harbor is mainly in coal, lumber, iron and steel (raw and manufactured), oysters and oyster shells, building material, petroleum products, fertilizer, and general steamboat freight. The reported tonnage for the calendar year 1911 was 1,995,401 short tons, valued at $124,261,691.17.

The precise effect of the project on freight rates is unknown, but the rates to New Haven are materially less than to other cities in the immediate vicinity without water facilities or with inadequate ones.

The available balance and future appropriations will be applied to the completion and maintenance of the project.

July 1, 1911, balance unexpended		$60,226.68
Received from sale of steamer *Castle*		420.45
		60,647.13
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$4,179.30	
For maintenance of improvement	36,979.63	
		41,158.93
July 1, 1912, balance unexpended		19,488.20
July 1, 1912, outstanding liabilities		11,229.05
July 1, 1912, balance available		8,259.15
Amount appropriated by river and harbor act approved July 25, 1912:		
West River	$54,000.00	
Mill and Quinnipiac Rivers	19,200.00	
		73,200.00
Amount available for fiscal year ending June 30, 1913		81,459.15
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 10,000.00

(See Appendix D 9.)

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[1] Exclusive of amount available for fiscal year 1913.

10. Breakwaters at New Haven, Conn.—New Haven Harbor is the only natural harbor of considerable area and depth in Long Island Sound between New London Harbor, 45 miles to the eastward, and Huntington Bay, 32 miles to the southwestward. Opposite New Haven, Long Island Sound is at its widest, about 19 miles, and the broad open mouth of the harbor in its natural condition left the anchorage ground exposed to storms from the southeasterly and southwesterly quarters, so that vessels were usually obliged to go from 2 to 4 miles up the harbor in order to obtain refuge, and even then the shelter was inadequate with the wind in some directions. The width of the harbor from Morgans Point to Oyster River Point is 4¼ miles, and the depths available for anchorage in the lower harbor were from 20 to 28 feet at mean low water.

The original project for this work, authorized by act of March 3, 1879, and approved January 31, 1880, and modified by act of September 19, 1890, in accordance with plans given in Annual Report of the Chief of Engineers, 1889, page 678, provided for a harbor of refuge at the entrance to New Haven Harbor, to be made by constructing four breakwaters—one 3,300 feet long, extending from Southwest Ledge to Quixes Ledge; one 5,000 feet long, extending from a point 1,000 feet north 54° east from Ludington Rock, in a direction south 54° west across the rock; one about 4,200 feet long, extending northwesterly from a point 6,000 feet south 54° west from Ludington Rock; and one about 1,200 feet long, extending southwesterly from Morgan Point on the east side of the harbor entrance—the cross section of all these breakwaters to be 12 feet wide on top and 6 feet above mean high water, with outer slope 1 on 2 and inner slope 1 on 1. The estimated cost from the beginning, in 1880, was $2,151,134.

April 21, 1910, the Chief of Engineers approved a revision of this project that provided for the omission of the Morgan Point Breakwater, the omission of any further extension of the middle breakwater, and a reduction of the outer slope of all the breakwaters from 1 on 2 to 1 on 1½. The estimated cost of completing the revised project at the time the revision was approved was $135,000, exclusive of appropriations made prior to that date, or $1,264,000 from the beginning of the work.

For original report on project (without map) see Annual Report of the Chief of Engineers, 1880, page 449, et seq., and for modification of project and map showing the location of the breakwaters as contemplated under the existing project see Annual Report of the Chief of Engineers for 1889, page 678, et seq.

The existing project, modified as stated above, now provides for a harbor of refuge at the entrance to New Haven Harbor, to be made by constructing three breakwaters, viz, one 3,450 feet long, extending from Southwest Ledge to Quixes Ledge; one 4,450 feet long, extending from a point 550 feet north 54° east from Ludington Rock, in a direction south 54° west across the rock; and one 4,200 feet long, extending northwestwardly from a point 6,000 feet south 54° west from Ludington Rock; the cross section of all these breakwaters to be 12 feet wide on top and 6 feet high above mean high water, with outer slopes of 1 on 1½ and inner slopes of 1 on 1, at a total estimated cost from the beginning of $1,264,000.

During the fiscal year the east breakwater was repaired, the middle breakwater increased in cross section to full project dimensions for a distance of 1,430 feet from a point 30 feet from its westerly end and the west breakwater extended to full project length of 4,200 feet, of which the westerly portion, for a distance of 2,530 feet from the westerly end, is completed, but some additional stones are still needed on the slopes of the easterly section, 1,670 feet long.

The total expenditure on this project to June 30, 1912, was $1,223,957.63, of which $20,572.15 was for maintenance. The sum of $3,243.46 was received from the sale of the steamer *Castle.*

The proportion of the project accomplished up to June 30, 1912, is 96½ per cent.

The anchorage sheltered by the breakwaters exceeds 2,000 acres, of which over 500 acres has depths of 20 to 28 feet, and the remainder is 9 to 20 feet deep.

The commerce benefited by this work is mainly the passing commerce of Long Island Sound. The breakwaters provide also an outer anchorage for vessels bound to and from New Haven and help to protect the entrance to New Haven Harbor proper from seas and to diminish channel filling.

The mean rise of tide is about 6 feet.

It is impracticable to estimate accurately the tonnage and value of the commerce benefited by this improvement, but it is certainly very large and practically amounts to the entire commerce passing through Long Island Sound. For the calendar year 1910 upward of 6,000 vessels were reported as seeking refuge behind the breakwaters, but no satisfactory report was received for the calendar year 1911. The effect of the project on freight rates is also indeterminate, but it probably results in considerably reducing insurance premiums. The available balance will be applied to the completion of this project, the additional work proposed being necessary to render the improvement permanent.

July 1, 1911, balance unexpended		$117,123.15
Received from sale of steamer *Castle*		3,243.46
		120,366.61
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$66,477.17	
For maintenance of improvement	10,603.61	
		77,080.78
July 1, 1912, balance unexpended		43,285.83
July 1, 1912, outstanding liabilities		77.40
July 1, 1912, balance available		43,208.43

(See Appendix D 10.)

11. Milford Harbor, Conn.—This harbor is about 8 miles to the southwestward of New Haven Harbor and about 10 miles to the northeastward of Bridgeport Harbor, both distances being measured by the ordinarily traveled water route. It is on the north shore of Long Island Sound and consists of a broad open bay about a mile square, from the head of which a small tidal stream extends nearly a mile inland to the head of navigation. The original depth on the bar in the bay at the mouth of the river was less than 2 feet. In parts of the river the channel ran nearly bare.

The original project, adopted under the act of June 23, 1874, provided for a riprap breakwater 890 feet long from Welchs Point, on the east side of the mouth of the harbor, protection of the bluffs on the east shore from erosion by means of small stone jetties, a jetty on the east side to maintain the river-bar channel, and dredging a channel 4 feet deep and 100 feet wide across the bar, the whole estimated to cost $85,000. This project was modified in 1878 and 1879 to provide for extending the 4-foot channel, 60 feet wide, upstream to the town dock and for a training dike off Burns Point, on the west side of the river channel, nearly at right angles to the east-side jetty. The project thus modified was completed in 1880, except that the outer breakwater was not built, being deemed unnecessary in view of the provision of a harbor of refuge at New Haven. Under the act of June 14, 1880, a project was adopted for the extension of the 4-foot channel, 40 feet wide, upstream to the Straw Works Wharf, and under the act of August 2, 1882, a revised project was adopted which provided for a channel 8 feet deep and 100 feet wide across the bar and upstream to Merwins dock, at estimated cost of $11,000.

In 1891 these projects were reported as completed and no further work necessary, except maintenance of jetties and dredged channels. It was stated in July, 1895, that as a result of private dredging there was a clear channel across the bar 12 feet deep and nowhere less than 80 feet wide. On the previous projects $45,500, and for surveys $1,600, were expended.

The existing project, authorized by act of June 13, 1902, for completion in accordance with plan printed in House Document No. 280, Fifty-sixth Congress, first session, at a cost of $15,000, consists in dredging and maintaining a channel across the bar and through the lower harbor, 100 feet wide and 10 feet deep, to Merwins Wharf, with an anchorage basin of same depth of about 5 acres area on the east side of the channel between the long dike and the harbor line, and a channel through the upper harbor from Merwins Wharf to the Straw Works Wharf, 90 feet wide and 6 feet deep. The estimated cost for maintenance was $1,000 biennially. The first cost of the improvement was subsequently ascertained to be $25,000.

For report on which the present project is based, see Annual Report of the Chief of Engineers for 1900, page 1357 et seq. For map, see House Document No. 280, Fifty-sixth Congress, first session.

No operations were conducted during the fiscal year. The expenditures reported were incurred in the identification of established harbor lines, collection of commercial statistics, and apportionment of office expenses.

The amount expended on this project to June 30, 1912, is $23,924.49, of which $307.16 was for maintenance.

The 10-foot channel has been completed to full project dimensions; the 6-foot channel has been completed to full project dimensions to a point about 500 feet above the town dock; a portion of the anchorage basin, about 2⅓ acres in area, on the east side of and adjacent to the 10-foot channel, dredged, and a basin 1.6 acres in area dredged on the opposite side of the channel, opposite Merwins Wharf. Owing to the ledge rock it was impracticable to complete the basin originally contemplated on the east side of the channel, and to extend the 6-foot channel up to the Straw Works Dock without exceeding the estimated cost. The basin dredged on the west side of the channel was intended to in part take the place of that portion of the basin on the east side which was omitted on account of ledge rock. The work done facilitates navigation in the lower part of the harbor and the extension of the 6-foot channel to the town dock renders it practicable to land cargoes there, which it was formerly extremely difficult to do. The development of the anchorage basins greatly relieves congestion in the lower part of the harbor, which is much frequented by pleasure and oyster craft, but the existing anchorage room is insufficient.

On June 30, 1912, a low-water draft of 9 feet could be carried over the bar and up as far as Merwins Wharf, thence 6 feet draft to just above the town dock, and thence draft of about 2½ feet can be carried to the Straw Works Dock.

The mean rise and fall of tide in this harbor is about 6.2 feet and the maximum amount approximately twice as much. The length of the improved channel from the outer end to its head is 1.2 miles; from the head of the improved channel to the Straw Works Dock is about one-tenth of a mile; no navigation is practicable above this dock.

The commerce of this harbor consists entirely of oysters, shells, coal, and fertilizer, the former predominating. The reported tonnage for the calendar year 1911 amounted to 34,350 short tons, valued at $634,870.

The effect of this improvement on freight rates is not positively known, but is believed to have resulted in reducing them.

The available balance and future appropriations will be applied to maintenance of the improvement.

July 1, 1911, balance unexpended		$3,326.54
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$95.21	
For maintenance of improvement	155.82	
		251.03
July 1, 1912, balance unexpended		3,075.51
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 5,000.00

(See Appendix D 11.)

12. Housatonic River, Conn.—This is a rapid river, rising in the Hoosac Mountains in the northwestern part of Massachusetts, running in a general southerly direction through Massachusetts and Connecticut and emptying into Long Island Sound east of Stratford Point about 5 miles to the eastward of Bridgeport Harbor. Its total length is about 130 miles. At Derby, about 13 miles from its mouth, it receives the discharge of the Naugatuck River, and about a mile above this point there is a large power dam across the Housatonic River; above the pool of the dam the river is rocky and shoal. Derby and Shelton are at the head of navigation.

The original depth on the worst bars in the river (6 in number) was from 3.5 to 4.5 feet. There was also a bar across the river mouth, with about 4 feet depth.

The original project for improvement, adopted under the act of March 3, 1871, provided for a jetty at Sow and Pigs Reef; removing

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[1] Exclusive of the balance unexpended July 1, 1912.

Drews Rock; a breakwater at the mouth of the river, and making a channel 7 feet deep, 200 feet wide through the bar at the mouth, and 150 feet wide in the river, at total estimated cost of $404,961. In 1887 the estimates were revised, and a modification of the project proposed a breakwater or jetty at the mouth of the river 5,750 feet long, extending about south-southeast from Milford Beach 3,250 feet; thence parallel to and 500 feet from the channel 2,500 feet farther, to the 12-foot curve in Long Island Sound, the inner arm of the jetty to be 3 feet above mean low water, top width 6 feet, side slopes 1 on 1; the outer arm to be 6 feet above high water, top width 12 feet, outer slope 1 and 2, inner slope 1 on 1; and a channel 7 feet deep, 200 feet wide at the outer bar, and 100 feet wide through the river, at a total estimated cost of $202,000, and $4,000 annually for maintenance, all in addition to amount already expended. This modification was adopted under the act of August 11, 1888, and work on the breakwater was begun July 10, 1889. In 1893 the project was further modified to provide for building a small dike in the river below Stratford.

For report on survey on which the original project was based, see House Document No. 95, Forty-first Congress, third session (with map), also Annual Report of the Chief of Engineers, 1871, page 781. For report on which the modification of 1888 was based, see Senate Document No. 103, Fiftieth Congress, first session, also Annual Report of the Chief of Engineers, 1888, page 554.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Derby to mouth	House	62	Forty-first	Second		
Do.[1]					1882	616
Mouth[1]					1886	642
Do.[1]					1887	607
Derby to mouth[1]	House	16	Fifty-fifth	First	1897[2]	979

[1] Contains map.

[2] No map.

The present project for improvement is the project of 1871, modified as stated above, and provides for a jetty at Sow and Pigs Reef; removing Drews Rock; a breakwater or jetty at the mouth of the river 5,750 feet long, extending about south-southeast from Milford Beach 3,250 feet, thence parallel to and 500 feet from the channel, 2,500 feet farther, to the 12-foot curve in Long Island Sound, the inner arm of the jetty to be 3 feet high above mean low water, top width 6 feet, side slopes 1 on 1; the outer arm to be 6 feet high above high water, top width 12 feet, outer slope 1 on 2, inner slope 1 on 1; a riprap dike in the river below Stratford not to exceed 1,500 feet in length; and a channel 7 feet deep at mean low water, 200 feet wide across the outer bar and 100 feet wide through the river, all at a total estimated cost of $275,500.

During the fiscal year a small amount of stone was added on the side slopes of the Stratford dike, ranges to aid in navigation were maintained, tidal observations by means of automatic gauges were taken, examinations were made from time to time of the various bars to determine their condition, and a line of levels was run from the mouth of the river to Derby and back to aid in establishing a system of satisfactory bench marks.

Up to June 30, 1912, $292,254.13 had been expended on this project, of which $86,170.79 had been applied to maintenance; $1,051.12 was received from the sale of steamer *Castle.*

At the close of the fiscal year the project was completed, except that the outer arm of the breakwater was not to full projected cross section, being only about 4 feet high above high water and considerably narrower and with steeper side slopes than are desirable for permanence; also it is possible that the Stratford dike, now 1,115 feet long, may need somewhat further extension, but this is considered rather improbable.

The work done has enabled vessels to enter the river in safety instead of waiting for high tide in an exposed situation outside, and has made possible the navigation of this river at nearly all stages of the tide by the classes of vessels which ordinarily use it. A large part of the commerce could not be carried on without the improved channel. The navigable channel to Derby and Shelton has materially reduced freight rates at these and adjacent towns, as otherwise all freight would have to be handled by rail and with no competition. On June 30, 1912, approximately 7 feet draft at mean low water could be carried across the outer bar and thence to the head of navigation at Derby and Shelton. The mean rise of tide is about 6.3 feet at the mouth of the river and 4.2 feet at Derby. Spring freshets in the river at Derby occasionally rise to 10 feet or more above mean high tide at that point.

The total length of that portion of the river under improvement, between the mouth and Shelton, is 13.3 miles; above this point the river is only navigable by small pleasure craft, etc., of light draft and for about three-quarters of a mile. A dam at Shelton makes navigation impossible above this point.

The commerce is principally coal, building materials, and petroleum products. A considerable quantity of oyster shells is shipped from near the mouth of the river. The reported tonnage for the calendar year 1911 was 97,098 short tons, valued at $534,098.85.

The precise effect of the improvement on freight rates is unknown, but it is known that the freight rates by rail to Derby and Shelton are considerably less than to other towns in the immediate vicinity not situated on a navigable waterway, and the freight rates by water to Derby and Shelton compare favorably with similar rates to other towns of equal size on Long Island Sound.

The available balance and future appropriations will be applied to maintenance and completion of the project.

Owing to changes in local conditions since the existing project was adopted, the local officer is of the opinion that certain modifications of the plan of improvement would be desirable, and a reexamination of the locality with a view to revision of the project is therefore recommended.

July 1, 1911, balance unexpended		$7,379.59
Received from sale of steamer *Castle*		1,051.12
		8,430.71
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$1,637.45	
For maintenance of improvement	546.27	
		2,183.72
July 1, 1912, balance unexpended		6,246.99
July 1, 1912, outstanding liabilities		.50
July 1. 1912, balance available		6,246.49
Amount appropriated by the river and harbor act approved July 25, 1912		10,000.00
Amount available for fiscal year ending June 30, 1913		16,246.49
Amount (estimated) required to be appropriated for completion of existing project		[1] 53,941.21
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 20,000.00

(See Appendix D 12.)

13. *Bridgeport Harbor, Conn.*—This harbor is about 57 miles to the northeastward from the Battery, New York City, and about 16 miles to the southwestward from New Haven Harbor, both distances being measured by the ordinarily traveled water route. It consists of a shallow bay about 1 mile wide at the mouth and 1½ miles long, into the extreme northwest corner of which empties the Poquonock River, a small tidal stream navigable for about 1 mile, and into the northeast corner another small stream about three-fourths of a mile long, known as Johnsons River. Midway between these two streams is Yellow Mill Pond, a tidal basin about 1 mile in length. Black Rock Harbor, formerly a separate project by itself, but now included in the project for the improvement of Bridgeport Harbor, lies about 2¼ miles to the westward of the latter-named harbor. Both harbors are inner portions of a large bay of Long Island Sound lying between the eastern part of Stratford Point and Fairfield Reef. Black Rock Harbor is about one-half mile wide at the mouth and 1 mile long, with two branches at its head, the east one a mile long, known as Cedar Creek, and the west one about three-fourths of a mile long, known as Burr Creek.

The original low-water depths were as follows: On the bar at the mouth of Bridgeport Harbor, about 5 feet; in the Poquonock River, from 2 to 5 feet; in Johnsons River, nearly bare in upper half; Yellow Mill Pond, generally bare; in Cedar Creek, 2 to 4 feet; and in Burr Creek, nearly bare.

Congress appropriated $10,000 in 1836 and an equal amount in 1852 for improving the main Bridgeport Harbor. These sums were expended in dredging near the mouth of the harbor, making channels 60 to 100 feet wide and 8 feet deep or more at low tide. The depth did not prove permanent. In 1871 and at various times thereafter the original project was enlarged to afford a 15-foot main-harbor channel, a 12-foot channel 200 feet wide in Yellow Mill Pond to Stratford Avenue, a 9-foot Poquonock River channel, a 12-foot anchorage, and to protect the harbor entrance by two breakwaters, all estimated to cost $285,000. This project was completed in 1898, except as to capacity of the 15-foot channel.

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[1] Exclusive of amount available for fiscal year 1913.

The amount expended on the projects above named was $317,848.50.

At Black Rock Harbor, between 1836 and 1838, $21,550 was expended in building a sea wall across a breach in the southern part of Fayerweather Island. In 1884 a project was adopted for protecting the upper part of Black Rock Harbor by a breakwater about one-half mile long between Fayerweather Island and the mainland and for making a 6-foot channel 80 feet wide in Cedar Creek. The channel had been made, the breakwater built to full length, but with reduced cross section, and the project was considered as completed July 1, 1894. Subsequently repairs were made on the old sea wall on Fayerweather Island. The amount expended for Black Rock Harbor as a separate improvement was $72,900.

In the act of March 3, 1899, Congress adopted a project for Bridgeport Harbor in accordance with the modified and extended project printed in the Annual Report of the Chief of Engineers for 1899, pages 1173–1176, which provided, at an estimated cost of not exceeding $300,000, for—

First. The main channel, 18 feet deep, 300 feet wide from the outer bar to the inner beacon, thence 200 feet wide to the lower or Stratford Avenue Bridge across the Poquonock River.

Second. Three anchorage basins: One 18 feet deep, 500 feet wide, and 2,000 feet long adjoining the main channel on the west above the inner beacon; one 12 feet deep, 500 feet wide, and 900 feet long adjoining the main channel on the west between the 18-foot anchorage and Naugatuck Wharf, and one 12 feet deep at east side of channel between the steel works point and the lower bridge.

Third. Poquonock River channel, from the lower bridge to the head of navigation, about 1 mile, 12 feet deep and 100 feet wide.

Fourth. Yellow Mill channel, from the main channel to the head of Yellow Mill Pond, about 1 mile, 12 feet deep and 100 feet wide.

Fifth. Johnsons River channel, from the main channel to the head of navigation, about 1¼ miles, 9 feet deep and 100 feet wide.

Sixth. Black Rock channel, from the head of Black Rock Harbor to the junction of Cedar and Burr Creeks, thence up each of these creeks to the head of navigation, with lengths, respectively, of 1⅓ miles and one-half mile, 9 feet deep and 100 feet wide.

Seventh. The repair and maintenance of the outer and inner breakwaters of the main channel, and the one connecting Fayerweather Island with the mainland as now built, and the construction and maintenance of shore protection on Fayerweather Island to check the shifting of the beach.

Work under the project of 1899 was begun July 9, 1900, was carried on under continuing contracts, and was completed, after many interruptions and delays, including the annulment of one contract, May 17, 1907, except a section of Burr Creek, the inner end of Yellow Mill channel, and the inner end of Johnsons River, where, on account of ledge rock, the full project dimensions of the channels were not obtained.

The amount expended on this project to June 30, 1908, was $233,912.50, of which $33,091.13 was applied to maintenance.

The act of March 2, 1907, authorized the extension of the project to include an anchorage basin 22 feet deep, 1,280,000 square feet in area opposite the inner breakwater, deepening the main entrance channel to 22 feet as far as the inner end of the 22-foot anchorage basin, an additional 12-foot anchorage basin 608,600 square feet in area northwest of the 22-foot basin, and two breakwaters for the protection of the deep anchorage basin, at an estimated cost of $463,000. The act appropriated $113,000 and authorized continuing contracts in the additional sum of $350,000 for completing the work authorized. Of this amount $165,000 has been appropriated.

At the time the original estimate for the part of the project adopted by the act of March 2, 1907, was made the possible application of the eight-hour law to dredging was taken into consideration and the unit price for this class of work increased 50 per cent on this account. As the eight-hour law was held not to apply to dredging, it was let at prices much below the estimate, and in March, 1910, the estimated cost of the 1907 part of the project was reduced $163,000, or to $300,000 from the beginning.

The river and harbor act of June 25, 1910, authorized the extension of the 18-foot channel up the Poquonock River to a point 750 feet below the head of the improved channel, widening the channel, and cutting off certain bends; the deepening of the channel in Cedar Creek to 12 feet, with slight widening at some of the bends; and the deepening of the Black Rock Harbor channel to 12 feet and its extension to the 12-foot contour in Long Island Sound, all at an estimated cost of $90,000, with $6,000 annually for maintenance after completion, in accordance with plan printed in House Document No. 751, Sixty-first Congress, second session.

For details of original projects and their modifications, see Annual Reports of the Chief of Engineers, 1893, pages 937–940, and map; and 1896, pages 803–805; also House Document No. 61, Fifty-fourth Congress, first session, map. For report on which the project of 1899 is based see Annual Report of the Chief of Engineers, 1899, pages 1173–1176; map not printed. For reports and maps on which the 1907 part of the existing project is based see House Documents Nos. 275 and 521, Fifty-ninth Congress, second session, and for the 1910 part of this project, with maps, see House Document No. 751, Sixty-first Congress, second session. For last published map see House Document No. 89, Sixty-second Congress, first session.

The existing project is the project of 1899 as modified by the acts of 1907 and 1910, and provides for—

First. The main channel, 22 feet deep and 300 feet wide from Long Island Sound to the inner end of the 22-foot anchorage basin, thence 18-feet deep and 200 feet wide to the lower or Stratford Avenue Bridge across the Poquonock River.

Second. Five anchorage basins: One 22 feet deep and 1,280,000 square feet in area, opposite the inner breakwater; one 18 feet deep, 500 feet wide, and 2,000 feet long adjoining the main channel on the west above the inner beacon; one 12 feet deep, 500 feet wide, and 900 feet long adjoining the main channel and immediately to the northwestward of the 18-foot anchorage; one 12 feet deep, 608,600 square feet in area, northwest of the 22-foot basin and adjoining the main channel on the east, and one 12 feet deep adjoining the main channel on the east and between the steel works point and the lower bridge

Third. Poquonock River channel, from the lower bridge to Black's coal dock, nearly 1 mile, 18 feet deep and from 100 to 230 feet wide, thence for 750 feet farther to head of navigation 12 feet deep and 100 feet wide.

Fourth. Yellow Mill channel, from the main channel to the head of Yellow Mill Pond, about 1 mile, 12 feet deep and 100 feet wide.

Fifth. Johnsons River channel, from the main channel to the head of navigation, about 1¼ miles, 9 feet deep and 100 feet wide.

Sixth. Black Rock and Cedar Creek channel, from the 12-foot curve in Black Rock Harbor to the head of navigation in both branches of Cedar Creek, a total length of nearly 2½ miles, 12 feet deep and 100 feet wide, with additional width at the turns; also Burr Creek channel from the junction with Cedar Creek channel to the head of navigation in Burr's Creek, about one-half mile, 9 feet deep and 100 feet wide.

Seventh. The extension of the east breakwater and the construction of the west breakwater at the entrance to Bridgeport Harbor, and the repair and maintenance of the existing breakwaters, and the construction and maintenance of shore protection on Fayerweather Island to check the shifting of the beach.

During the fiscal year the upper portion of the 18-foot main channel, portions of the 18-foot anchorage basin, and the lower portion of the Yellow Mill channel were restored to project depths where shoaling had taken place.

The amount expended on the modified project up to the close of the fiscal year ending June 30, 1912, was $334,832.48, of which $19,414.21 was applied to maintenance. The sum of $1,177.26 was received from the sale of the steamer *Castle* and $25,000 was collected from surety on account of defaulting contractor.

The entire existing project for this harbor may now be considered as completed, with the exception of the slight deficiencies, referred to above, in the project authorized by the act of 1899, and which are fully explained in the Annual Report for 1910, page 1168.

The work done has greatly facilitated the navigation of the harbor, particularly in the Cedar Creek and Poquonock River channels, which could formerly only be used by deep-draft vessels at, or nearly at, high tide. The breakwaters and 22-foot anchorage basin form a much-needed harbor of refuge for the tows of heavily laden coal barges bound to the eastward.

The maximum draft that could be carried June 30, 1912, through the improved channels at mean low tide is: Twenty-two feet through the main channel from the outer end in as far as the turn just inside the inner breakwaters, and thence 18 feet to the lower bridge; in the Poquonock River, 18 feet from Stratford Avenue to the East Washington Avenue Bridge, through the bridge a depth of only about 12 feet exists, but from a point 100 feet above the bridge to a point opposite Black's coal dock a draft of 18 feet may be carried, and thence, to the head of the improved channel, about 11 feet; in the Yellow Mill channel, 12 feet to Stratford Avenue, and thence 9 or 10 feet to head of the improved channel; in Johnsons River, 9 feet to the turn above the shipyard, and thence about 8 feet to the head of the channel; at Black Rock, 12 feet to the head of navigation in both branches of Cedar Creek; in Burr Creek, about 7 feet to its head. The mean rise of tide is about 6.5 feet.

The total length of the channels under improvement is as follows: Main channel, from lower end to Stratford Avenue Bridge, 2.8 miles; Poquonock River, from Stratford Avenue Bridge to end of improved channel, 1.1 miles; Yellow Mill channel, from main channel to head of navigation, 1.06 miles; Johnsons River, from 22-foot basin to head of navigation, 1.1 miles; Black Rock channel, from outer end to head of navigation in Cedar Creek, including length of both branches, 2.5 miles; Burr Creek, from Cedar Creek channel to head of navigation, one-half mile. All of the above-named improved channels extend practically to the head of navigation in each portion of the harbor.

The commerce of this harbor is chiefly in coal, lumber, iron, steel, building material, petroleum products, oysters, and general merchandise. Tonnage reported for calendar year 1911 was 1,007,147 short tons, valued at $42,043,640.99.

The precise effect of the improvement on freight rates is not known, but to unimproved harbors not far distant, and in some cases nearer the point of shipment, the rates are from 25 to 50 per cent higher.

The balance on hand will be applied to maintenance.

July 1, 1911, balance unexpended		$73, 154. 21
Received from sale of steamer *Castle*		1, 177. 26
Collected from American Surety Co. account defaulting contractor		25, 000. 00
		99, 331. 47
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$6, 600. 00	
For maintenance of improvement	14, 865. 73	
		21, 465. 73
July 1, 1912, balance unexpended		77, 865. 74
July 1, 1912, outstanding liabilities		241. 55
July 1, 1912, balance available		77, 624. 19
Amount of continuing contract authorization, act of Mar. 2, 1907		350, 000. 00
Amount appropriated under such authorization		165, 000. 00
Amount yet to be appropriated		185, 000. 00

(See Appendix D 13.)

14. Norwalk Harbor, Conn.—This harbor is about 13 miles to the southwestward of Bridgeport. It consists of an outer or main harbor, also known as Sheffield Island Harbor, about 2 miles long and from one-half to three-fourths of a mile wide, lying between the Norwalk Islands and the mainland; an inner harbor, which is Norwalk Harbor proper, about 1⅔ miles long from its lower end to the highway bridge at South Norwalk and averaging about one-half mile in width; and the tidal part of Norwalk River, extending from South Norwalk to Norwalk, about 1½ miles. The river is not navigable above Norwalk. The depth which could be originally carried up to South Norwalk was about 5 feet at low tide, and between there and Norwalk the river bed was nearly bare.

The sum of $80 was expended in the year 1829 in making a survey of the harbor in accordance with the act of Congress approved March 2 of that year.

The original project, adopted under the act of June 10, 1872, and modified by the terms of the act of June 14, 1880, provided for a channel 100 feet wide and 8 feet deep from the outer harbor to South

Norwalk, and thence 6 feet deep to Norwalk. This project was considered completed in 1892 at a cost of $83,000, although portions of the channel between Norwalk and South Norwalk were only 60 feet wide. The act of August 18, 1894, appropriated $15,000 for improving the inner harbor, and indicated the points where work was to be done. In accordance therewith a project was adopted for removing to 6 feet depth the shoal at Ferrys Point, below Norwalk, and, if funds permitted, for widening with depth of 9 feet the bend at Keysers Island, near the river mouth. This project was completed in 1897, at a cost of $15,000. A project adopted by the act of June 3, 1896, provided for a channel 10 feet deep and 150 feet wide from the outer harbor to South Norwalk, widening two points near the entrance, and the maintenance of this channel and the 6-foot channel between South Norwalk and Norwalk, at estimated first cost of $62,000, and $2,000 annually for maintenance. This project was completed October 3, 1905; the amount expended on it was $36,833, of which $15,516.89 was expended for maintenance.

The present project, adopted by the act of March 2, 1907, is in accordance with plan printed in House Document No. 262, Fifty-ninth Congress, second session, which provides for the restoration of the channel 10 feet deep and 150 feet wide to South Norwalk; for a channel 8 feet deep, of a general width of 100 feet, from South Norwalk to Norwalk, and for a channel 6 feet deep, 2,900 feet long, of a general width of 75 feet, to the docks at East Norwalk, and for maintenance of these channels, at an estimated first cost of $63,500, and $8,000 per annum for maintenance.

For reference to reports and maps regarding this harbor and former projects, see Annual Report of the Chief of Engineers for 1904, page 103. For present project and map, see House Document No. 262, Fifty-ninth Congress, second session. For report on preliminary examination and survey with map with reference to the modification of the project, see House Document No. 396, Sixty-first Congress, second session.

No modification of the existing project has been made since its adoption.

No operations were conducted during the fiscal year other than the necessary inspection of private improvements authorized by the Secretary of War and some survey work with reference to the establishment of harbor lines and bench marks.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $57,682.94, of which $13,577.92 was applied to maintenance. The sum of $1,009.08 was received from sale of steamer *Castle*.

The present project was completed September 19, 1908.

The effect of the improvement has been to greatly facilitate navigation in this harbor, particularly between South Norwalk and Norwalk, where much deeper draft vessels can now be used than was formerly possible.

The maximum draft that could be carried at low water June 30, 1912, to the South Norwalk docks was 10 feet, to the Norwalk docks 8 feet, and to the East Norwalk docks 6 feet. The mean rise of tide is 7.1 feet.

The length of the improved channel from its outer end, opposite Keyser Island, to the railroad bridge at South Norwalk is 2.55 miles, and thence to the head of navigation at Norwalk 1.45 miles; the length of the East Norwalk Channel from its junction with the main channel to the head of navigation at East Norwalk is 0.6 mile. No navigation is possible above the head of the improved channels at Norwalk and East Norwalk.

The commerce of this harbor is mainly in coal, oysters, lumber, wood pulp, building material, and general merchandise, and on all of these items the improvement has effected a material reduction in freight rates. The reported tonnage for the calendar year 1911 amounted to 206,248 short tons, valued at $1,958,275.76.

The balance available will be applied to maintenance of the improvements.

July 1, 1911, balance unexpended	$10, 663. 11
Received from sale of steamer *Castle*	1, 009. 08
	11, 672. 19
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	846. 05
July 1, 1912, balance unexpended	10, 826. 14
July 1, 1912, outstanding liabilities	302. 56
July 1, 1912, balance available	10, 523. 58

(See Appendix D 14.)

15. Harbors at Fivemile River, Stamford, Southport, Greenwich, and Westport, and Saugatuck River, Conn.—(a) Fivemile River Harbor.—This harbor is about 3 miles to the southwestward of Norwalk Harbor and about 16 miles in the same direction from Bridgeport Harbor. It is a tidal inlet about 1 mile long and from 100 to 1,000 feet wide. The natural low-water depth at the mouth was about 3 feet, shoaling to zero about halfway up the harbor and to about plus 2.5 feet at extreme head. The original and present project of improvement, adopted under authority of the act of August 11, 1888, provides for a dredged channel 8 feet deep and 100 feet wide, extending up the harbor about 6,000 feet from its mouth. The estimated cost from the beginning, as revised in 1894, was $45,000.

For further details regarding this harbor see Annual Report of the Chief of Engineers, 1901, page 192. For original report of examination on which the present project is based see Annual Report of the Chief of Engineers, 1887, part 1, page 639. For sketch see Annual Report of Chief of Engineers, 1894, page 676.

No revision of the existing project has been made since its adoption, except in regard to cost, which was originally estimated at $25,000, $20,000 being added to this estimate in 1894, as stated above.

During the fiscal year, those portions of the channel already dredged were restored to project dimensions.

The total amount expended on this project up to the close of the fiscal year ending June 30, 1912, was $45,900.92, of which $10.410.48 was applied to maintenance. The sum of $105.11 was received from the sale of the steamer *Castle*.

A channel of project dimensions has been dredged about 5,400 feet up the harbor, and thence about 200 feet farther with project depth and widths of 25 feet to 75 feet. No dredging has been done above this point. The project is about 82 per cent completed.

The commerce of Fivemile River is confined almost exclusively to the oyster business, the greater part of which could not be carried on to any advantage without the improved channel.

The maximum draft that could be carried June 30, 1912, through the improved channel was 8 feet to within about 200 feet of its head, thence about 6 feet to the head of the channel, above which point no navigation is possible except at high tide, when a draft of from 4 to 4½ feet can be carried for about one-fourth of a mile farther to the head of navigation. The mean rise of tide is about 7.2 feet.

The length of the channel as now dredged is 1.03 miles and the total length from the entrance to the head of navigation is about 1.27 miles.

The commerce of this harbor is mainly confined to the oyster industry. Tonnage reported for the calendar year 1911 amounted to 12,278 short tons, valued at $124,718.50.

The effect of the project on freight rates is unknown.

The available balance and future appropriations will be applied to maintenance of the improvement.

Owing to changes in local conditions since the existing project was adopted, the local officer is of the opinion that certain modifications of the plan of improvement would be desirable, and a reexamination of the locality with a view to revision of the project is, therefore, recommended.

July 1, 1911, balance unexpended	$6,985.04
Sale of steamer *Castle*	105.11
	7,090.15
June 30. 1912, amount expended during fiscal year, for maintenance of improvement	6,095.52
July 1, 1912, balance unexpended	994.63
July 1, 1912, outstanding liabilities	17.27
July 1, 1912, balance available	977.36
Amount (estimated) required to be appropriated for completion of existing project	[1] 9,300.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	([2])

(*b*) *Stamford Harbor.*—This harbor is located about 21 miles to the southwestward of Bridgeport Harbor. It consists of a bay on the north short of Long Island Sound, about 2 miles wide across its mouth and extending inland nearly 1½ miles. From the head of this bay, or outer harbor, two tidal inlets, known as the east and west branches, extended northerly to the head of navigation at the city of Stamford. The west branch is the tidal portion of Mill River, a small stream dammed at the Oliver Street Bridge at the head of the harbor; the east branch, originally a small, crooked stream running through the salt marsh, was first straightened and deepened by private enterprise and was known as "The Canal." The original depth in the west branch was from 1 to 3 feet, gradually increasing in the bay to a depth of 12 feet; the original depth in the east branch was very little, but owing to the private work mentioned above, the available depth when work was begun by the Government in 1892, was about 6½ feet at mean low water, with width of about 60 feet nearly to its head.

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[1] Exclusive of the balance unexpended July 1, 1912.
[2] See consolidated money statement on page 175.

The original project, adopted under authority of the river and harbor act of 1886, was for a 5-foot channel 80 feet wide to the head of the west branch. This was considered completed in 1892 after an expenditure of $20,000, the channel being 5 feet deep and 100 to 140 feet wide at the bends, but only from 50 to 70 feet wide for the last thousand feet at the upper end.

The present project, adopted under authority of the act of July 13, 1892, provides for a channel in the west branch 7 feet deep, 150 feet wide, and about 1⅛ miles long, with a basin of same depth between harbor lines at the head of the harbor, and in the east branch, as approved October 5, 1892, a channel 9 feet deep and 100 feet wide for a length of about 8,535 feet and 50 feet wide for about 1,200 feet farther to the head of the harbor. The estimated cost was $123,500. A modification to give increased width at upper end of east branch was approved February 12, 1901.

For report of survey on which the present project is based, see Annual Report of the Chief of Engineers, 1891, page 849; for information relative to the modification of the project to provide for dredging in the east branch, see Annual Report of the Chief of Engineers 1893, page 955 (map, p. 956); for last published map showing harbor at head of west branch, see Annual Report of the Chief of Engineers, 1908, page 1024.

No modification of the existing project, other than as stated above, has been made.

During the fiscal year the basin at the head of the west branch was completed, thereby completing the entire project.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $147,922.34, of which $32,879.49 was applied to maintenance. The sum of $420.45 was received from the sale of the steamer *Castle*.

The improvements made have rendered it possible for the regular freight and passenger steamers between Stamford and New York to run on schedule time and to reach their docks in the east branch at any stage of the tide, which they were formerly unable to do. The work done in the west branch has greatly facilitated the delivery of freight in this portion of the harbor and has made available for anchorage purposes the basin at the head of this branch which is much frequented by large numbers of small craft.

The maximum draft which could be carried June 30, 1912, to the head of the basin in the west branch was 7 feet, and 9 feet through the east branch channel to its head. The mean rise of tide is about 7.4 feet.

The length of the improved channel from the outer end to the head of the east branch, which is the head of navigation in this portion of the harbor, is 1.8 miles; the length of the west branch channel from its junction with the east branch to the head of the basin is 1.15 miles; from the basin at the head of the west branch to the Oliver Street Bridge the harbor is navigable for about 0.1 mile at high tide, with draft of about 6 feet.

The commerce of this harbor consists mainly of coal, lumber, sand, stone, iron and iron pipe, and steamboat freight. The tonnage reported for the calendar year 1911 amounted to 260,469 short tons, valued at $12,737,399.36.

The precise effect of the project on freight rates is unknown, but it is believed to have materially reduced them, particularly in the west branch.

The available balance will be applied to the maintenance of the existing channels and basin.

July 1, 1911, balance unexpended		$18,612.20
Sale of steamer *Castle*		420.45
		19,032.65
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$5,952.53	
For maintenance of improvement	321.48	
		6,274.01
July 1, 1912, balance unexpended		12,758.64
July 1, 1912, outstanding liabilities		74.14
July 1, 1912, balance available		12,684.50

(*c*) *Southport Harbor.*—This harbor is located about halfway between Bridgeport and Norwalk Harbors, being distant about 7 miles, by water, from each. It consists of the tidal part of Mill River at the town of Southport, the harbor thus formed being about 1 mile long and averaging less than 100 yards wide. The original depth was probably less than 2 feet at the entrance to the harbor, shoaling to about plus 1 foot at the upper end. Work was begun in this harbor by the Government in 1829 and prosecuted with various intermissions until 1878. During this time a dike inside and breakwater or jetty outside were built, and a channel 60 feet wide and 4 feet deep dredged across the outer bar. In 1878 a project was adopted for dredging a channel 100 feet wide and 4 feet deep across the bar and upstream 1,200 feet from the outer end of the jetty, and thence in a bifurcated channel to the nearest docks. In 1882 this project was reported as substantially completed, $31,587.23 having been spent since the beginning of work in 1829.

The present project, originally adopted by act of June 13, 1902, was to dredge a channel 6 feet deep through the outer bar to the upper docks 100 feet wide to the turn above White Rock, and thence in two branches, each 60 feet wide; to repair the breakwater and to remove two points of ledge from the channel to a depth of 7 feet. The original estimated first cost of this improvement was $13,200, and for yearly maintenance $300, to be expended biennially, but on account of the development of two additional outcroppings of ledge during the dredging it became evident that this estimate would be greatly exceeded before the work could be completed, and in 1906 the estimated cost was increased to $33,000 for this work.

The river and harbor act of July 25, 1912, appropriated $15,000 for completing the improvement of this harbor in accordance with the modified project recommended in the Annual Report of the Chief of Engineers for 1911, pages 145 and 1245–1246. The project as thus modified provides for a channel 6 feet deep and 100 feet wide from the 6-foot curve in Long Island Sound to the second turn inside of the breakwater, and thence with same depth and width of 75 feet upstream as far as the docks and with same depth and width of 60 feet along the dock front; also to dredge an anchorage basin 6 feet deep and 75 feet wide outside of the above-described channel and to remove two pieces of ledge rock to depth of 7 feet, all at an estimated cost of $15,000 in addition to the amount previously expended, and for maintenance $800 annually, to be expended as needed, but probably not oftener than once in two or three years.

For report of survey (map not printed) on which the project of 1902 was based, see Annual Report of the Chief of Engineers, 1897, page 986; also House Document No. 112, Fifty-fourth Congress, second session. For report (no map) on which the modification of 1912 is based, see Annual Report of the Chief of Engineers, 1911, page 1245.

No operations were conducted during the year.

The total amount expended on this project up to the close of the fiscal year ending June 30, 1912, was $20,848.51, of which $2,177.53 was for maintenance.

At the close of the fiscal year a channel of project depth and 75 to 100 feet width had been dredged to the turn above White Rock, and thence with full depth and widths of 40 to 60 feet up the east branch and along the dock front for about 200 feet; two points of ledge rock had been removed, and the breakwater repaired.

The result of the improvement to date has been to make the harbor navigable at all stages of the tide by vessels of light draft, which are the only ones which use it at present; it has also made the harbor available as a refuge for a large number of oyster craft which work in the vicinity.

The maximum draft that can be carried June 30, 1912, through the improved portion of the channel is about 4½ feet from the outer end to a point just inside the north beacon, thence to the docks at Southport 6 feet. The mean rise of tide is about 6.6 feet.

The length of the improved channel is 0.94 mile; above the head of the improved channel draft of about 6 feet at high tide can be carried for about one-half mile farther.

The commerce of the harbor consists mainly of coal, oysters, shells, and building material. The reported tonnage for the calendar year 1911 amounted to 5,368 short tons, valued at $25,500.

The effect of the improvement on freight rates, if any, is not known.

Amount appropriated by river and harbor act approved July 25, 1912	$15,000.00
Amount available for fiscal year 1913	15,000.00

(*d*) *Greenwich Harbor.*—This harbor is a shallow bay about 2 miles easterly from the New York State line and about 5 miles southwesterly, by water, from Stamford Harbor. It extends northward about a mile from the 9-foot curve in Long Island Sound to the head of navigation.

The original low-water depth was about 6 feet to the lower docks. Above this point it shoaled rapidly to 3 feet 1,000 feet above and to about plus 2 feet at the head of the harbor. The original and present project, adopted in the act of June 3, 1896, is to dredge a channel 90 feet wide from the mouth of the harbor to the causeway at its head, a distance of about a mile, to be 9 feet deep to the steamboat dock and 6 feet deep above, the upper end to be enlarged to form a turning basin. The estimated first cost was $20,000.

For report of examination (no map) upon which the project is based, see Annual Report of the Chief of Engineers, 1895, page 860; also House Document No. 25, Fifty-third Congress, third session. For map, report, and estimate on a desirable modification of the project, see House Document No. 309, Sixty-first Congress, second session.

The project has not been modified since its adoption.

During the fiscal year the channels were restored to project dimensions.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $23,343.17, of which $6,325.98 was for maintenance. The sum of $240.26 was received from the sale of the steamer *Castle*.

This project was entirely completed September 23, 1905, the dredging during the fiscal year being entirely for purpose of maintenance.

The work done has enabled vessels to enter the harbor with 9 feet draft at low tide, thus permitting the regular steamer to make trips without waiting for tide.

On June 30, 1912, draft of 9 feet at mean low water could be carried from the outer end to the head of the 9-foot channel at the steamboat dock, and thence 6 feet to the turning basin at the head of navigation. The mean rise of tide is about 7.5 feet.

The length of the improved channel, from the outer end to the head of the turning basin, is 1 mile. No navigation is possible beyond this point.

The commerce of this harbor consists mainly of coal, lumber, building material, and general merchandise. The reported tonnage for calendar year 1911 amounted to 101,500 short tons, valued at $9,323,250.

It is reported that the result of the improvement has been to reduce freight rates.

The available balance and future appropriations will be applied to maintenance.

July 1, 1911, balance unexpended	$3,494.30
Sale of steamer *Castle*	240.26
	3,734.56
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,240.94
July 1, 1912, balance unexpended	1,493.62
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	([1])

(*e*) *Westport Harbor and Saugatuck River, Conn.*—Saugatuck River is a tidal stream, the entrance to which is about 10 miles to the southwestward of Bridgeport Harbor. Its navigable portion extends inland about 4½ miles, by course of channel from Long Island Sound to Westport, Conn. It has a natural depth of 5 feet at mean low water, in a rather narrow, crooked channel up to the railroad bridge at Saugatuck, about 3 miles from the Sound; thence the depth, before improvement, decreased gradually until at Westport it was less than 1 foot. The channel was somewhat obstructed by rocks in its upper part.

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[1] See consolidated money statement on p. 175.

For nearly 2 miles below Westport the stream is from 200 to 1,200 feet wide. Below this it expands into a rather broad inner bay, with a narrow channel following the west, south, and east shores and then turning abruptly to the southeast and passing to the Sound between Cedar Point on the north and Cockenoes Island on the south. On the south side of the inner bay lies Great Marsh, which is connected with Cockenoes Island by a broad sand flat, nearly bare at low tide; and east of the island a reef of bowlders extends eastward 1½ miles, so that the only entrance to the harbor at low tide is to the eastward of this reef.

The navigable part of the river is crossed by three bridges, all having draws of sufficient size for the commerce of the stream.

In 1826 Congress appropriated $400 for a survey of the river and harbor of Saugatuck. In the report of the survey a project was submitted for deepening the channel at Westport, removing two rocks in the river, building a breakwater on Cedar Point, and cutting a canal through Great Marsh, at a total estimated cost of $6,128.65. The project was completed nearly as designed in 1840. The breakwater at Cedar Point was made about 390 feet long, the top being 4 feet above high water and 10 feet wide, and the canal was excavated 1,350 feet long, 44 feet wide at the bottom, and 4 feet deep, and part of the east side was protected by a dry wall. The amount appropriated for and expended upon this project was $14,044.

Appropriations made in 1867 and 1870, $2,500 each, were applied to surveys and to repairing and extending the breakwater at Cedar Point.

The present project, adopted in 1892, originally provided for a channel 4 feet deep and 60 feet wide up to Westport, at an estimated cost of $10,000.

As a result of a survey authorized by the act of August 18, 1894, the project was modified in 1896 to provide for repairing the Cedar Point breakwater, removing a ledge opposite Stony Point, or dredging around it, and removing bowlders from the channel, at an estimated cost of $8,000, and the total estimated cost was in consequence increased to $18,000.

For report on the preliminary examinations on which the 1892 part of the present project is based, see Annual Report of the Chief of Engineers for 1911, page 840, and 1893, page 990; also House Documents No. 179, Fifty-first Congress, second session, and No. 114, Fifty-second Congress, second session (no maps printed). For report of survey on which the 1896 part of the project is based, see Annual Report of the Chief of Engineers, 1896, page 806; also House Document No. 67, Fifty-fourth Congress, first session (with map). For map see also Annual Report of the Chief of Engineers, 1894, page 670.

The existing project, modified as stated above, now provides for a channel 4 feet deep and 60 feet wide up to Westport; for removing the ledge opposite Stony Point; for removing bowlders from the channel, and for repairing Cedar Point breakwater, all at an estimated cost of $18,000.

No operations were conducted during the fiscal year.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $15,770.99, of which $610.44 was for maintenance. The sum of $126.13 was received from the sale of the steamer *Castle*.

The 4-foot channel has been completed to Westport with width generally of 60 feet, the ledge opposite Stony Point removed, and the Cedar Point breakwater repaired and extended. The channel above referred to was completed in 1896, and since that time has much deteriorated, especially in the upper portions, and the Cedar Point breakwater is again in need of repair.

The project is about 70 per cent completed. Its completion requires further removal of bowlders and dredging to full project dimensions in the upper portion of the channel and also repairs to the Cedar Point Breakwater.

The improvements made have rendered navigation of the river practicable at about one-half tide by small vessels and at high tide by lightly laden coal barges. The maximum draft that could be carried at mean low water on June 30, 1912, was about 6 feet from the outer end to the highway bridge at Saugatuck, thence about 3½ feet to the lowest docks at Westport; from this point the depth at mean low water rapidly diminished to nearly zero at the head of the west branch channel and to about 2 feet at the head of the improved channel in the east branch at the Westport drawbridge; above the drawbridge the bottom is bare or nearly so at low tide. The mean rise of tide is about 7 feet.

The total length of this waterway from Long Island Sound to the head of the improved channel at the Westport drawbridge is about 4¼ miles; above this point the stream is only navigable at high tide and by small craft for one-fourth mile, except that lightly laden coal barges are taken through the drawbridge through a small natural channel to a dock about 500 feet above the bridge.

The commerce consists mainly of coal. The tonnage reported for the calendar year 1911 was 14,011 short tons, valued at $56,076.87.

The improvements made have not been sufficient to materially decrease freight rates, which are much higher in this harbor than in any other improved harbor in this vicinity.

Future appropriations will be applied to maintenance and the completion of the project.

Sale of steamer *Castle*	$126.13
July 1, 1912, balance unexpended	126.13
July 1, 1912, outstanding liabilities	15.27
July 1, 1912, balance available	110.86
Amount (estimated) required to be appropriated for completion of existing project	[1] 3,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	([2])

CONSOLIDATED.

July 1, 1911, balance unexpended	$29,091.54
Received from sale of steamer *Castle*	891.95
	29,983.49

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[1] Exclusive of the balance unexpended July 1, 1912.

[2] See consolidated money statement on this page.

June 30, 1912, amount expended during fiscal year:		
For works of improvement	$5,952.53	
For maintenance of improvement	8,657.94	
		$14,610.47
July 1, 1912, balance unexpended		15,373.02
July 1, 1912, outstanding liabilities		106.68
July 1, 1912, balance available		15,266.34
Amount appropriated by river and harbor act approved July 25, 1912		15,000.00
Amount available for fiscal year ending June 30, 1913		30,266.34
Amount (estimated) required to be appropriated for completion of existing project		[1] 14,300.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 5,000.00

(See Appendix D 15.)

16. Mystic River, Conn.—This river is a narrow tidal stream in the eastern part of the State of Connecticut. The river extends in a general northeasterly direction for about 6 miles from Fishers Island Sound past the villages of Noank, West Mystic, and Mystic to Old Mystic. The village of Mystic lies on both the east and west banks of the river, about 3 miles above Fishers Island Sound, the westerly portion being in the town of Groton and the easterly portion in the town of Stonington. At this point the river is crossed by a highway drawbridge. At the highway bridge the river is about 150 feet in width. From this point to the head of the river the shore lines are very irregular, varying in width from 150 feet to about one-half mile.

The mean rise of the tide is 2½ feet.

The river and harbor act of September 19, 1890, adopted a project for the improvement of this stream, in accordance with a recommendation printed in the Annual Report of the Chief of Engineers for 1889, page 746, of a preliminary examination dated October 26, 1888, which contemplated dredging a channel 15 feet deep at mean low water and 100 feet wide from Fishers Island to the highway bridge and reducing five bends in the channel at an estimated cost of $30,000, subsequently modified and increased $6,600, making the total estimated cost $36,600, which amount was appropriated and expended on the project.

The river and harbor act approved July 25, 1912, adopted a new project for maintenance and restoration of project dimensions by redredging the channel, at an estimated cost of $3,500, in accordance with report on a preliminary examination and survey printed in House Document No. 858, Sixty-first Congress, second session. The estimated cost of the above-mentioned work is appropriated by the said act.

Amount appropriated by river and harbor act approved July 25, 1912	$3,500.00
Amount available for fiscal year ending June 30, 1913	3,500.00

(See Appendix D 16.)

17. Removing sunken vessels or craft obstructing or endangering navigation.—(*a*) *Wreck of the Adrienne.*—On June 7, 1911, the wooden auxiliary schooner yacht *Adrienne*, 51.3 feet long and 16.9 feet beam, sunk in the anchorage basin at the head of the west branch channel,

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[1] Exclusive of the balance unexpended July 1, 1912.

Stamford Harbor, where she was abandoned after being partially stripped by the owners. This wreck was removed during July, 1911, under open-market agreement at a total cost of $75.

(*b*) *Wreck of the Stephen E. Babcock.*—The wooden towboat *Stephen E. Babcock*, built in 1883, 67.3 feet long and 16.2 feet beam, gross tonnage 46, took fire August 8, 1911, and was partly burned and beached on the easterly side of the dredged channel in Cedar Creek, Bridgeport Harbor, and subsequently abandoned. This wreck was removed in October, 1911, under open-market agreement at a total cost of $200.

(*c*) *Wreck of the Clara Waples.*—The wooden schooner *Clara Waples*, built in 1881, 80.5 feet long, 20.5 feet beam, gross tonnage 74, sunk on the northerly bank of the lower 12-foot anchorage basin, Bridgeport Harbor, on May 23, 1911. Her cargo was subsequently removed, but the vessel itself was abandoned. Under open-market agreement the vessel was raised in January, 1912, and placed on adjacent mud flats out of the way of navigation until April, 1912, when the vessel was completely removed. The total cost was $200.

(*d*) *Wreck of the Edith E. Denis.*—On November 12, 1911, the two-masted schooner *Edith E. Denis*, length 86.6 feet, breadth 26.5 feet, sunk in Plum Gut, off the Plum Island Light Station, N. Y., in about 100 feet of water and was abandoned by her owners. The masts and bowsprit broke from the hull and were held afloat by the rigging. Under open-market agreement all portions of the wreck above a plane 43 feet below mean low water were removed in December, 1911, at a total cost of $100.

(*e*) *Sunken scow in Connecticut River.*—Under date of May 3, 1912, a sunken scow, about 50 feet long and 20 feet wide, in the Connecticut River opposite Hartford, Conn., was reported. Bids for the removal of the scow were opened June 18, 1912, but all bids were rejected as excessive.

(See Appendix D 17.)

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and surveys required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. *Preliminary examination of Thames River, West Channel, from Poquetanuck Drawbridge to Kiteamaug, for 14-foot channel.*—Report dated September 26, 1910, is printed in House Document No. 260, Sixty-second Congress, second session. The improvement of this river by the General Government in the manner apparently desired is not deemed advisable at the present time.

2. *Preliminary examination and survey of New Haven Harbor, Conn., with a view to improving the channel by way of Oyster Point to the bridge of the New York, New Haven & Hartford Railroad Co., on West River.*—Reports dated October 13, 1910, and July 17, 1911, with map, are printed in House Document No. 535, Sixty-second

Congress, second session. A plan for improvement, at an estimated cost of $50,000 for first construction and $4,000 annually for maintenance, is presented.

The local officer was also charged with the duty of making other preliminary examinations and surveys provided for by the river and harbor act approved June 25, 1910, as follows, and reports thereon will be duly submitted when received:

1. *Cove Harbor, Conn., with a view to providing an entrance channel of increased depth.*
2. *Darien Harbor, Conn.*

EXAMINATION AND SURVEY MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Reports dated June 21 and November 14, 1911, with map, on preliminary examination and survey, respectively, *of Mystic River, Conn., from the drawbridge between Groton and Stonington to the head of navigation*, required by the river and harbor act approved February 27, 1911, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 637, Sixty-second Congress, second session. A plan for improvement, at an estimated cost of $8,160 for first construction and $1,000 every 10 years for maintenance, is presented.

IMPROVEMENT OF RIVERS AND HARBORS IN THE FIRST NEW YORK, N. Y., DISTRICT.

This district was in the charge of Col. W. M. Black, Corps of Engineers, division engineer, having under his immediate orders Capt. R. D. Black, Corps of Engineers, with station at Albany, N. Y.

1. *Port Chester Harbor, N. Y.*—This harbor, situated at the boundary between the States of New York and Connecticut, about 32 miles, by water, east of the Battery, New York City, consists of the tidal part of Byram River and of a shallow bay about 100 acres in extent at its mouth opening into Long Island Sound. About 1 mile above its mouth the river is crossed by a fixed bridge at Mill Street, and a short distance above the bridge is an old dam. The source of the river is about 13 miles north of the dam. The navigable part of the river, situated below the bridge, is about 100 to 300 feet wide, and before improvement had a mean low water depth of about 1 foot. Salt Rock, in the river, and Sunken Rock, in the bay, were considered to be dangerous obstructions. The section under improvement extends from Sunken Rock to the fixed bridge, a distance of about 1½ miles.

The original project for this improvement, adopted in 1872, modified in 1884 and 1888, and enlarged in 1899 and 1907, provided for the removal of Salt Rock to 9 feet below mean low water; the construction of a breakwater from Sunken Rock to Byram Point, and a channel 12 feet deep at mean low water and 70 feet wide from deep water in the bay up to the town wharf, at Fox Island, and thence 9 feet deep and 60 feet wide to the steamboat wharf, including the removal of ledges of rock opposite the southerly point of Fox Island, at an estimated cost of $82,000. Prior to operations under the existing project there had been expended $91,369.12, of which amount $16,369.12 was for maintenance, and the project had been completed with the exception of the removal of the ledges of rock. Received from sales and reimbursements under this project $4.90.

The existing project adopted by the river and harbor act of June 25, 1910, provides for a channel 150 feet wide and 12 feet deep at mean low water from Long Island Sound to the southerly point of Fox Island; thence 100 feet wide and 10 feet deep to 900 feet below the fixed bridge at Mill Street, including a turning basin opposite the steamboat landing; and thence 175 to 100 feet wide and 3 feet deep to 100 feet below the fixed bridge, in acordance with plan printed in House Document No. 1165, Sixtieth Congress, second session. Estimated cost, $188,000 and $2,500 annually for maintenance. This project has not been modified.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Salt Rock to Sunken Rock [1]	Senate	23	Forty-second	Second	1872 [1]	809
Fixed bridge to Fox Laland [2]					1885	658
Fox Island to Sunken Rock [2]					1889	716
Fixed bridge to Sunken Rock [1]	House	45	Fifty-third	Third	1895 [1]	865
Do.[1]	do	59	Fifty-sixth	First	1900 [1]	1423
Do.[2]	do	1165	Sixtieth	Second		

[1] No map.

[2] Contains map.

The work accomplished during the fiscal year consisted in completing the romoval of ledge rock in the easterly side of the channel opposite Bents Wharf. The expenditure during the year, amounting to $22,879.86, was all for improvement.

Up to June 30, 1912, $37,008.25 had been expended on the existing project, all for improvement. There was received from sales and reimbursements $4.30.

About 19 per cent of the work proposed under the project has been completed and has resulted in widening the channel in the turn on the easterly side of Fox Island and at a point opposite Bents Dock, these localities having been theretofore among the most difficult sections of the river to navigate.

On June 30, 1912, a maximum draft at mean low water of about 10 feet could be carried up to the southerly point of Fox Island, thence to the steamboat wharf about 9 feet, thence to Highland Street about 2 feet, and thence to the head of navigation less than 1 foot. Mean range of tides, 7.29 feet. The length of the section improved by the United States is about 1⅜ miles. The head of navigation is at a fixed bridge at Mill Street, about 900 feet above the steamboat dock. The total length of navigable channel from Long Island Sound to the bridge is about 1½ miles.

The tonnage and value of the commerce of this harbor, mainly in general merchandise, coal, building materials, manufactured goods, and farm produce, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1898	140,000	$4,936,000	1905	293,000	$7,365,000
1899	169,500	6,256,000	1906	265,000	6,870,000
1900	181,000	7,269,500	1907	275,000	7,405,000
1901	327,500	9,118,000	1908	265,000	7,355,000
1902	237,000	900,000(?)	1909	255,067	7,630,200
1903	240,000	3,940,000	1910	247,223	7,370,880
1904	255,000	4,590,000	1911	287,280	9,165,453

So far as has been ascertained, the improvement of this harbor has brought about and maintaining a reduction in freight rates.

The amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, is to be applied to continuing the improvement by dredging and rock removal.

July 1, 1911, balance unexpended	$31,011.39
Received from sales, etc	.30
	31,011.69
June 30, 1912, amount expended during fiscal year, for works of improvement	22,879.86
July 1, 1912, balance unexpended	8,131.83
Amount appropriated by river and harbor act approved July 25, 1912	10,000.00
Amount available for fiscal year ending June 30, 1913	18,131.83
Amount (estimated) required to be appropriated for completion of existing project	[1] 132,864.22
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 15,000.00

(See Appendix E 1.)

2. *Mamaroneck Harbor, N. Y.*—This harbor, situated on the north shore of Long Island Sound, about 5 miles west from the Connecticut State line and about 27 miles, by water, east of the Battery, New York City, consists of an inlet opening into a shallow bay about 1 square mile in area, and having a least mean low water depth of about 7 feet at the mouth of the inlet. Mamaroneck River, whose source is about 7 miles north of the harbor, empties its waters into the head of the inlet at a fixed bridge at Boston Post Road in Mamaroneck. The section under improvement extends from the head of the bay to the fixed bridge, a distance of about 1 mile. Before improvement, a narrow winding channel extending to the old steamboat wharf, half a mile up the inlet, had a depth of 5 feet at mean low water, gradually decreasing to 1 foot at the upper wharves. Various rocks at and near the mouth of the inlet obstructed navigation.

The project for this improvement, adopted August 2, 1882, provided for the removal of Round Rock to a mean low-water depth of 4 feet; Bush Rock, Nells Rock, Inner Steamboat Rock, Outer Steamboat Rock, and Little Nanhook to a depth of 7 feet; in dredging a channel 100 feet wide and 7 feet deep from Long Island Sound to the old steamboat wharf, and thence 80 feet wide and 4 feet deep to the upper wharves; and in closing a small channel east of Grassy Knoll. Estimated cost, $43,000.

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[1] Exclusive of amount available for fiscal year 1913.

Under date of April 27, 1899, the project was modified by omitting Little Nanhook, Inner Steamboat Rock, and Outer Steamboat Rock, and by providing for the extension of the channel of 100 feet width and 7 feet depth to the upper wharves. No change was made in the estimate of cost.

This project, as modified, provides for the removal of Round Rock to a depth of 4 feet and Bush Rock and Inner Steamboat Rock to a depth of 7 feet at mean low water, and for making a channel 7 feet deep at mean low water and 100 feet wide from the harbor entrance to the upper wharves.

No funds being available no works of improvement or of maintenance have been done here since 1905. The deterioration of the dredged channel has been such that to complete the project and restore the channel to its contemplated width and depth (a work of maintenance) $21,000 would be required. About 82 per cent of the work proposed under the project has been completed, and has resulted in making a channel 7 feet deep at mean low water and from 70 to 100 feet wide from the harbor entrance to the turn at Hog Island, and thence 100 feet wide to the upper wharves. The dredged channel has deteriorated to a considerable extent, as shown by a survey made pursuant to act of Congress of March 3, 1909, the report upon which was submitted April 11, 1910, and is printed in House Document No. 1087, Sixty-first Congress, third session.

Up to June 30, 1912, $40,000 had been expended on this work; of this amount $4,628.50 was for maintenance.

The river and harbor act approved July 25, 1912, adopted a modification of the existing project, in accordance with report printed in House Document No. 1087, Sixty-first Congress, third session, so as to provide a straighter channel 7 feet deep and 80 feet wide, except at bends and near its upper end, a turning basin, cross section, and extension of main channel up to Boston Post Road Bridge, at an estimated cost of $29,500, with $1,000 annually for maintenance, subject to the condition that any necessary easements for right of way and for the disposition of dredged material on Harbor Island shall be furnished by local interests free of cost to the United States. The full amount of the estimate for this improvement is appropriated by the act.

References to examination and survey reports, and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Long Island Sound to fixed bridge [1]	Senate	84	Forty-seventh	Third	1882 [1]	687
Do.[2]					1886	658
Do.[2]					1908	859
Mouth of inlet to fixed bridge [2]	House	1087	Sixty-first	Third		

[1] No map.

[2] Contains map.

The maximum draft at mean low water that could be carried June 30, 1912, to the steamboat landing in Mamaroneck is estimated at 6¼ feet in midchannel; thence to the head of navigation about 5 feet. Mean range of tides, 7.3 feet. The length of the improved channel is about 1 mile.

The head of navigation is at a fixed bridge just above the steamboat landing. The total length of navigable channel from Long Island Sound is about 1¾ miles.

The tonnage and value of the commerce of this harbor, mainly in general merchandise, coal, and building materials, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1896	29,096	$482,092	1905	54,944	$801,898
1897	51,678	877,180	1906	15,756	181,008
1901	20,705	51,598(?)	1908	38,540	1,020,225
1902	48,496	75,000(?)	1909	106,344	1,260,982
1903	26,230	337,000	1910	35,627	1,078,500
1904	49,589	859,242	1911	26,335	1,214,896

It is not known that freight rates have been affected by this improvement, but it has facilitated the transportation, especially of coal and building materials. The crookedness of the existing channel as well as its slight width and depth have prevented any considerable freight-bearing commerce, as reported in the project submitted April 11, 1910, in compliance with the river and harbor act of March 3, 1909. With an adequate and safe channel of approach shipments can be made by water at a lower rate than by rail.

Amount appropriated by river and harbor act approved July 25, 1912	$29,500.00
Amount available for fiscal year 1913	29,500.00

(See Appendix E 2.)

3. Larchmont Harbor, N. Y.—This harbor, situated on the northwest shore of Long Island Sound, about 7 miles west of the Connecticut State line, and 25 miles, by water, east of the Battery, New York City, consists of a bay about half a mile wide and five-eighths of a mile long, with a mean low water entrance depth of 18 feet gradually diminishing toward the head of the bay. A small unimportant stream, flowing through low lying marshes, empties its waters into the head of the bay. In its original condition the bay was exposed to easterly and southerly storms, and two submerged rocks (Umbrella Rock and Huron Rock) obstructed the entrance. The area to be protected under the project is about 150 acres in extent.

The original project for this improvement, adopted September 19, 1890, provided for building two breakwaters to protect the anchorage ground, one to extend from Umbrella Rock to Umbrella Point and the other from Huron Rock to Long Beach Point, at an estimated cost of $105,000. Work under this project was suspended in 1891 after the first appropriation of $5,000 had been expended in commencing the two breakwaters.

The existing project, adopted March 3, 1899, as approved by the Secretary of War April 18, 1899, is a modification of the project of 1890, and provides for building a breakwater extending southwardly 1,440 feet from the 6-foot curve off Long Beach Point, and for the removal of Huron Rock to a depth of 14 feet at mean low water, in accordance with plan printed in House Document No. 40, Fifty-first Congress, first session. Estimated cost, $108,000. The project was extended by the river and harbor act of March 2, 1907, to include removal of ledges adjoining Huron Rock. No increase was made in the estimate of cost.

The existing project, as modified, provides for building a breakwater extending southwardly 1,440 feet from the 6-foot curve off Long Beach Point, and for the removal of Huron Rock and ledges adjoining Huron Rock to a depth of 14 feet at mean low water.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Long Island Sound to head of bay[1]	House	[1] 40	Fifty-first	First	1890 [2]	675
Do.[1]					1908	860

[1] Contains map.

[2] No map.

No work of improvement or maintenance was done during the year. The expenditures during the year, amounting to $280.60, were in payment of the cost of inspecting the work of improvement; in part payment of the purchase of Mill Rock, East River, N. Y., for storage purposes, and in part payment of office expenses.

To June 30, 1912, $77,970.54 had been expended on the existing project, all for improvement. There was received from sales $0.65.

About 74 per cent of the work proposed under the existing project has been completed, and as a result the breakwater has been built to full projected section to a length of 1,410 feet and Huron rock and the adjoining ledges have been removed to a depth of 14 feet below mean low water.

The maximum draft that could be carried June 30, 1912, over the shoalest part of the entrance channel at mean low water is estimated at 18 feet. The protected anchorage area of the harbor of from 6 to 12 feet depth at mean low water, resulting from the construction of the breakwater and the removal of rock ledges, is about 60 acres in extent.

The harbor has but little commerce. It is mainly used by the Larchmont Yacht Club, by coasting and fishing vessels for night anchorage, and as a harbor of refuge. In 1910 the fleet of the Larchmont Yacht Club was valued at $2,000,000.

Local freight rates are thought not to have been affected by the improvement.

The available funds are sufficient for completing the improvement should further work be deemed necessary, and will be applied to this purpose and to maintenance.

July 1, 1911, balance unexpended	$8,215.60
Received from sales, etc	.15
	8,215.75
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	280.60
July 1, 1912, balance unexpended	7,935.15

(See Appendix E 3.)

4. Harbor at Echo Bay, N. Y.—This harbor, situated on the north shore of Long Island Sound, about 8 miles west of the Connecticut State line and 24 miles, by water, east of the Battery, New York City, consists of a shallow inlet about five-eighths of a mile long and 300 to 2,000 feet wide, and a bay at its mouth about three-eighths of a mile long and one-fourth of a mile wide. The inlet, or inner harbor, is landlocked except at its extreme outer end, and the bay, or outer harbor, is exposed to southeasterly storms. In its original condition the low water channel leading from the bay up to the wharves was only 1 to 2 feet deep, and was obstructed by Long Rock, Start Rock, and Sheepshead Reef. The first was exposed at low water, and the two latter had not more than 1.6 feet and 2.2 feet depth of water over them, respectively, at mean low water. The distance from the 18-foot contour in the bay to the head of the inlet is about three-fourths of a mile. The section included in the project extends from the 10-foot contour in the bay to Beauford Point, a distance of about 1,300 feet.

Sheldrake River, whose source is situated about 6 miles north of the harbor, empties into a mill pond, situated in the southeastern shore of the inner harbor. A dam at the mouth of the pond is also used as a highway.

The original project for improvement adopted June 18, 1878, and modified in 1902, 1905, and 1907, provided for the removal of Start Rock and Sheepshead Reef to 7 and 9 feet depth below mean low water, respectively, the dredging of a channel 40 feet wide and 4 feet deep at mean low water from Beauford Point to within 300 feet of the head of the harbor, and the removal of Long Rock to a depth of 6 feet below mean low water, at an estimated cost of $49,000. All the work contemplated under this project and its subsequent modifications has been completed at a total cost of $47,379.41, of which amount $10.41 was for maintenance. There was received from the sale of maps $1.25.

The existing project, adopted by the river and harbor act of June 25, 1910, is in accordance with plan printed in House Document No. 1118, Sixtieth Congress, second session, and provides for a channel 10 feet deep at mean low water and 100 feet wide, extending from the 10-foot contour in Echo Bay to the city wharf at Beauford Point (Hudson Park), and a turning basin of the same depth at the inner extremity of the channel. Estimated cost, $22,110. This project was completed, without modification, in 1911, at a total cost of $18,281.71.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Sheepshead Rock and Start Rock					1876 [1]	263
Long Island Sound to above Beauford Point.					1880 [2]	513
Sheepshead Rock	House	[1] 38	Fifty-third	Third		
Long Island Sound to head of inlet	do	[2] 235	Fifty-sixth	First	1900 [1]	1424
Long Rock	do	[1] 182	Fifty-ninth	Second		
Bay to Beauford Point	do	[2] 1118	Sixtieth	do		
Long Island Sound to head of inlet					1903 [2]	862

[1] No map. [2] Contains map.

No work of improvement or maintenance was done during the year. The expenditures during the year, amounting to $5,069.03, were in payment of outstanding liabilities, representing the amount due the contractor for work of improvement completed in June, 1911; in part payment of the purchase of Mill Rock, East River, N. Y., for storage purposes; and in part payment of office expenses.

Up to June 30, 1912, $18,281.71 had been expended, all for improvement. There was received from sales $2.50.

The project was completed June 20, 1911, by excavating a channel 10 feet deep at mean low water and 100 feet wide, with a turning basin of the same depth at its head, and widening at the bend. This channel extends from the 10-foot contour in the bay to the city wharf at Hudson Park, a distance of 1,300 feet.

The maximum draft that could be carried through the improved channel on June 30, 1912, was 10 feet at mean low water. Beyond this are two channels dredged by private parties, the one leading northward and the other about northwestward from the head of the turning basin at Beauford Point, and both are said to have a depth of not less than 6 feet at mean low water. The outer harbor anchorage of from 9 to 18 feet depth at mean low water is about 20 acres in extent. The mean range of tide is about 7¼ feet. The head of navigation is about three-eighths of a mile above Beauford Point. The length of channel improved is about one-fourth of a mile, and the total length of navigable channel extending from deep water of the harbor is about three-fourths of a mile.

Nearly all of the water transportation of the town of New Rochelle is carried on through this harbor.

The tonnage and value of the commerce of this harbor, mainly in building materials, coal, and general merchandise, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1902	99,000	$500,000	1907	269,135	$2,545,535
1903	129,400	1,434,000	1908	244,750	2,092,500
1904	151,200	1,647,500	1909	248,180	2,604,150
1905	193,650	2,071,800	1910	267,900	3,215,400
1906	270,460	2,789,208	1911	387,650	3,917,382

Commerce has been materially benefited and freight rates have been reduced by this improvement.

The available funds are to be applied to maintenance as may be necessary.

July 1, 1911, balance unexpended	$12,521.41
Received from sales, etc	.25
	12,521.66
June 30, 1912, amount expended during fiscal year, for works of improvement	5,069.03
July 1, 1912, balance unexpended	7,452.63

(See Appendix E 4.)

5. *Bronx River and East Chester Creek, N. Y.*—(*a*) *Bronx River.*—This stream is about 15 miles long and flows in a general direction slightly west of south. It empties into a shallow bay or estuary about one mile long and 300 to 4,500 feet wide, which opens into the East River north of Hunts Point. The navigable part of the river, which is also the section included in the project for improvement, about 50 to 300 feet in width, lies wholly within the limits of Greater New York about 11 miles, by water, east of the Battery, New York City, and extends from its mouth to a dam at West Farms, a length of about 2¼ miles. Above the dam the river is very narrow, shallow and tortuous. The natural depth at the mouth was 4 feet at mean low water, and decreased ascending the stream to about 4 feet at mean high water at the head of navigation.

The original, which is also the existing, project for improvement was adopted June 3, 1896, and provides for making a channel 4 feet deep at mean low water and 100 feet wide from the mouth to Barlow Street (now Falconer Street); thence to Dongan Street (now Garrison Avenue) 60 feet wide, and thence to the head of navigation 50 feet wide, the work to be done by dredging and rock removal. Estimated cost, $85,985. This project has not been modified.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
West Farms to East River	House	[1] 54	Forty-sixth	Third	1881 [1]	665
West Farms to head of bay					1891 [1]	949
Railroad bridge to gas works					1904 [2]	1016

[1] No map.

[2] Contains map.

The expenditures during the year, amounting to $3,884.79, were for the purpose of maintenance, and resulted in dredging a channel 50 feet wide and about 500 feet long, through a bar which had formed in the mouth of the river, and in removing shoals which had formed in about 500 feet in length of the river about three-fourths of a mile above the mouth.

Up to June 30, 1912, $84,212.01 had been expended on the project for improvement, of which amount $16,774.98 was for maintenance. There was received from sales of maps $7.70.

About 78 per cent of the work proposed under the present project has been completed and has resulted in making a channel from the mouth to the turn east of the gas works with depths of from 3 to 6 feet at mean low water and with diminishing widths as projected, except at and below Westchester Avenue, where slightly reduced by ledges of rock. Above the gas works the channel remains in its original condition, except for the partial removal of rocks and bowlders which obstructed navigation in the vicinity of the dye works wharf, and of a few rocks which endangered navigation near the head of the projected improvement. The dredged channel has deteriorated to a considerable extent.

The maximum draft that could be carried June 30, 1912, over the shoalest part of the channel at mean low water from the mouth to the turn east of the gas works, a distance of about 1¾ miles, is about 3 feet for widths varying from 35 to 50 feet; above this point the depth gradually decreases to 1 foot or less for a width generally less than 50 feet, and at the head of navigation it is only about 4 feet at mean high water. The depth in the estuary is but about 3 feet at mean low water. Mean range of tide is 6.6 feet at mouth and 6 feet at West Farms. The length of the improved section extends from the mouth to the gas works, a distance of about 1¾ miles. The head of navigation is at a dam just beyond the dye works. The total length of navigable channel from the East River at Hunts Point is about 3 miles.

The tonnage and value of the commerce of this river, mainly in building materials and coal, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1897	139,310	$526,025	1906	341,538	$1,720,097
1899	171,300	1,985,700	1907	382,967	1,807,317
1902	153,187	500,000	1908	401,433	2,017,500
1903	77,710	536,400	1909	520,215	1,272,266
1904	42,236	196,642	1910	456,756	2,020,336
1905	181,093	320,482	1911	681,181	2,458,798

As the result of the improvement the cost of transportation has been reduced and the river has an extensive and growing commerce, as shown above. This commerce is mainly carried on barges of from 20 to 35 feet width, towed by tugs. Just complaint is made of the interruptions and delays to traffic owing to the impossibility of tows passing each other in the narrow channel and at points of even passing a barge moored to a wharf. Due to the slight depth found, all movement of vessels must be made at high water stages.

July 1, 1911, balance unexpended	$16,178.23
Received from sales, etc	2.25
	16,180.48

June 30, 1912, amount expended during fiscal year for maintenance of improvement	$3,884.79
July 1, 1912, balance unexpended	12,295.69
July 1, 1912, outstanding liabilities	323.69
July 1, 1912, balance available	11,972.00
July 1, 1912, amount covered by uncompleted contracts	11,485.69
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 30,000.00

(*b*) *East Chester Creek.*—This creek, also known as Hutchinsons River, empties into East Chester Bay in the north shore of Long Island Sound about 12 miles west of the Connecticut State line and about 21 miles, by water, east of the Battery, New York City. Its source is situated about 9 miles slightly east of north from its mouth. The bay is about 3 miles long and about 1,000 feet to 1½ miles wide, and has a minimum navigable depth of 5 feet for a width of 600 feet. The navigable tidal section of the creek, 100 to 1,000 feet in width, extends about 2½ miles above its mouth; above this the stream is narrow and tortuous and practically a rivulet, affected by tides for a length of but about 3,000 feet. The lower 2 miles of the navigable section lies wholly within the limits of Greater New York. The business center of the city of Mount Vernon is situated about 1½ miles northwest of Lockwoods. The section under improvement extends from about 1,900 feet below Pelham Highway Bridge at the mouth of the creek to above Fulton Avenue Bridge, a length of about 3 miles. In its original condition the creek was navigable at high tide for vessels drawing 7 feet to Lockwoods, at Boston Post Road, about 2½ miles above the head of the bay; above this it was narrow, tortuous, and of slight depth.

The original project for improvement, adopted March 3, 1873, and modified in 1891, provided for a channel 100 feet wide and 9 feet deep, mean high water, from deep water in East Chester Bay to a point 3,000 feet above Lockwoods. Estimated cost, $124,000. This project was completed in 1899 at a cost of $89,091.22, and since then, up to June 30, 1910, $26,410.78 had been expended in maintenance.

There had been received from the sale of maps $3.

The existing project, adopted by the river and harbor act of June 25, 1910, provides for a channel 5 feet deep at mean low water and 150 feet wide from about 1,900 feet below Pelham Highway Bridge to about 700 feet above the New York, New Haven & Hartford Railroad bridge; thence 100 feet wide to about 1,200 feet below Lockwoods; and thence 70 feet wide to about 300 feet above Fulton Avenue Bridge, in accordance with report submitted in House Document No. 1250, Sixtieth Congress, second session. Estimated cost, $103,000, and $3,000 annually for maintenance. This project has not been modified.

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[1] Exclusive of the balance unexpended July 1, 1912.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to 6,000 feet above Lockwoods.	House	[1] 242	Forty-second	Second	1872 [1]	812
Do					1886 [2]	664
Do					1893 [2]	968
3,000 feet above Lockwoods to 6,000 feet above Lockwoods.	House	[1] 147	Fifty-fourth	Second	1897 [1]	1175
Do	do	[1] 186	Fifty-eighth	do	1904 [1]	1061
Mouth to 3,000 feet above Lockwoods.					1904 [2]	1017
Head of bay to 3,000 feet above Lockwoods.	House	[1] 1250	Sixtieth	Second		

[1] No map.

[2] Contains map.

The expenditure during the year, amounting to $19,428.04, was all for improvement and resulted in nearly completing the removal to the projected width and a depth of 6 feet below mean low water of two rock ledges situated approximately 500 feet and 1,500 feet below Lockwoods, respectively, and in dredging a channel 5 feet deep at mean low water and 40 feet wide from the upper ledge to just below Lockwoods.

On June 30, 1912, $21,564.79 had been expended on the existing project, all for improvement. There was received from sales $3.30.

About 22 per cent of the work proposed under the present project has been completed. Work under the existing project has not advanced far enough to be of any great benefit to navigation.

The maximum draft that could be carried over the shoalest part of the channel on June 30, 1912, to town wharf, about 1¼ miles above the mouth of the creek, is about 3 feet at mean low water; above this the available depth is estimated at 2 feet or less in mid-channel. Considerable shoaling constantly occurs from the filling in of the material from side slopes and from material carried into the stream by sewers and rivulets at the head of the improvement.

Mean range of tides is 7.1 feet. The length of the section improved under previous projects is about 2½ miles. Under the existing project the improved sections are approximately 900 feet and 400 feet long, situated at and below Lockwoods, and about 1,500 feet below Lockwoods, respectively. The head of navigation is at the upper end of the artificial channel. The total length of navigable channel from the East River is about 5 miles, of which about 3 miles is included in the project for improvement.

The tonnage and value of the commerce of this creek, mainly in building material, coal, oil, steel, and products, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1895	94,928	$2,199,186	1906	282,655	$3,063,360
1899	286,428	1,957,224	1907	354,019	1,954,254
1902	99,750	870,500	1908	278,369	2,864,000
1903	104,655	572,800	1909 [1]	1,190,669	4,325,364
1904	146,955	963,263	1910	378,400	4,356,900
1905	206,275	1,755,850	1911	435,626	1,956,608

The effect of this improvement under past projects has been to increase the number of firms carrying on business along this stream. So far as has been learned, this improvement has made no change in railroad freight rates, but the effect has been to increase water-borne commerce, for which freight rates are lower than rail rates. Work under the present project has not progressed sufficiently to have any appreciable effect on commerce.

It is proposed to apply the amount estimated for the fiscal year ending June 30, 1914, to continuing the improvement by dredging and rock removal.

July 1, 1911, balance unexpended	$31,864.25
Received from sales, etc	.30
	31,864.55
June 30, 1912, amount expended during fiscal year, for works of improvement	19,428.04
July 1, 1912, balance unexpended	12,436.51
July 1, 1912, outstanding liabilities	3,962.64
July 1, 1912, balance available	8,473.87
Amount appropriated by river and harbor act approved July 25, 1912	10,000.00
Amount available for fiscal year ending June 30, 1913	18,473.87
July 1, 1912, amount covered by uncompleted contracts	2,503.45
Amount (estimated) required to be appropriated for completion of existing project	[2] 59,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[2] 20,000.00

CONSOLIDATED.

July 1, 1911, balance unexpended	$48,042.48
Received from sales, etc	2.55
	48,045.03
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	23,312.83
July 1, 1912, balance unexpended	24,732.20
July 1, 1912, outstanding liabilities	4,286.33

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[1] Exceptional tonnage due to heavy railroad construction.

[2] Exclusive of amount available for fiscal year 1913.

July 1, 1912, balance available	$20,445.87
Amount appropriated by river and harbor act approved July 25, 1912	10,000.00
Amount available for fiscal year ending June 30, 1913	30,445.87
July 1, 1912, amount covered by uncompleted contracts	14,049.14
Amount (estimated) required to be appropriated for completion of existing project	[1] [2] 59,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[2] 50,000.00

(See Appendix E 5.)

6. *Westchester Creek, N. Y.*—This is a small stream lying wholly within the limits of Greater New York, extending from an estuary about 14 miles by water east of the Battery, New York City, northward a distance of about 4 miles. The estuary is about 1 mile long and 500 to 3,000 feet wide, with a navigable depth of 5 feet at mean low water. The section of the creek included in the project ends at a causeway and fixed bridge at Main Street, in Westchester. It is about 1.7 miles long and 110 to 500 feet wide. Above the bridge the stream was narrow, shallow, and tortuous. It is probable that within recent years the bed of the creek above the bridge has been filled in to a considerable extent by city and railroad improvements.

When surveyed in 1891 the creek was navigable at mean low water for vessels drawing 3½ feet and had a navigable channel varying in width from about 20 to 80 feet.

The section included in the project for improvement extends from the East River across the estuary to the fixed bridge, a distance of about 2¾ miles.

The original, which is also the existing, project was adopted June 25, 1910, and provides for a channel 8 feet deep at mean low water and 100 feet wide across the estuary; thence 80 feet wide to about 1,000 feet above Scriven's wharf; and thence 60 feet wide to the head of navigation, in accordance with plan printed in Rivers and Harbors Committee Document No. 7, Sixty-first Congress, second session. Estimated cost, $42,780 and $2,000 annually for maintenance. This project has not been modified.

References to examination or survey reports and map or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
East River to fixed bridge	House	[3] 111	Fifty-sixth	First		
Do					1891 [4]	955
Do					1900 [4]	1430

[1] For East Chester Creek.

[2] Exclusive of amount available for fiscal year 1913.

[3] Contains maps.

[4] No map.

Contract has been entered into for this work but active operations had not been commenced at the close of the fiscal year. Expenditures for the year amounting to $1,663.13, were in payment of the cost of marking the limits of work under a contract now in force, of the cost of printing and advertising; and in part payment of office expenses, and of the purchase price of Mill Rock in East River for storage purposes.

Up to June 30, 1912, $5,418.52 had been expended in making a resurvey and map of the reach to be improved, including the development of rock surfaces over which the projected depth is to be obtained; in part payment of office expenses, including marking the limits of the contract work, and of printing and advertising for the contract; and in part payment of a gasoline cutter and of Mill Rock, East River, bought for a storage yard.

When resurveyed in 1910 a maximum draft of 5 feet could be carried over the bar in the estuary, from which point up to within about 1,500 feet below the head of navigation at a fixed bridge at Main Street in Westchester the depth was generally greater; above this to the head of navigation the maximum available draft was about 3½ feet. It is not probable that an appreciable change in these depths has taken place since then. Mean range of tides, 6.8 feet. The length of navigable channel from the East River is about 2⅜ miles, no part of which has yet been improved.

The tonnage and value of the commerce of this creek, as obtained from the best available information, and consisting mainly in building materials, coal, etc., are as follows:

Year.	Short tons.	Value.
1890	50,000	$242,000
1909	263,857	1,371,235
1911	148,117	699,564

Effect on rates awaits completion of channel to be dredged under a contract now in force.

July 1, 1911, balance unexpended	$39,024.61
Received from sales, etc	6.45
	39,031.06
June 30, 1912, amount expended during fiscal year, for works of improvement	1,663.13
July 1, 1912, balance unexpended	37,367.93
July 1, 1912, outstanding liabilities	69.97
July 1, 1912, balance available	37,297.96
July 1, 1912, amount covered by uncompleted contracts	35,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 12,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 12,000.00

(See Appendix E 6.)

7. *East River and Hell Gate, N. Y.*—East River, a tidal strait about 16 miles long and 600 to 4,000 feet wide, exclusive of bays and

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[1] Exclusive of the balance unexpended July 1, 1912.

estuaries, separating New York City from Long Island, extends from the Battery, in New York City, to Throgs Neck, at the head of Long Island Sound. Though a channel navigable by seagoing vessels has always existed, it was in its original condition rendered tortuous and dangerous by rocks and reefs, especially in the part known as Hell Gate.

The improvement of this waterway was commenced by the city of New York in 1851 by the removal of parts of the smaller rocks obstructing Hell Gate and of part of Diamond Reef. There was expended on this work $13,861.59.

On August 30, 1852, Congress appropriated $20,000 for the removal of rocks at Hell Gate and Diamond Reef. This sum was expended in reducing Pot Rock to 20.5 feet below mean low water.

By act of March 5, 1868, a project was adopted for removing obstructions in East River, including Hell Gate. Three hundred thousand dollars was appropriated for prosecuting the work, reduced later, by allotment, to $85,000.

This project provided for the removal to 26 feet depth below mean low water of Pot Rock, Frying Pan Reef, Ways Reef, Shell Drake, Heel Tap, rock off Negro Point, Scaly Rock, Hallets Point, Middle Reef, Diamond Reef, Coenties Reef, and Battery Reef; the construction of sea walls on Hogs Back, Holmes Rock, Great and Little Mill Rocks, Bread and Cheese, and Rylanders Reef; and the construction of a dike closing the channel between Bread and Cheese and Blackwells Island. Middle Reef includes the rocks designated in earlier reports as Negro Head, Flood Rock, Hen and Chickens, and Gridiron. Estimated cost, $8,692,645.15.

In 1874 this project was modified by omitting the construction of the sea walls and dike; by including Diamond and Coenties Reefs in the estimate; and by reducing the estimated cost of improvement to $5,139,120. This reduction was due to lessened unit costs resulting from improved methods in prosecuting the work of improvement.

Since 1874 the adoption of further improvements in methods and appliances has resulted in again largely reducing unit costs. The total of the estimate of cost of improvement was not, however, decreased on this account, but in accordance with the general project for "removing rocky obstructions in the East River and Hell Gate," and with the approval of higher authority, a dike connecting Great and Little Mill Rocks has been constructed, and rocky obstructions in other points of the East River have been removed "as the necessities of navigation demanded." These points are as follows: Harlem River, removing piers and abutments; reef near North Brother Island; Pilgrim Rock; reef off Diamond Reef; reef off Thirty-fourth Street (now Ferry Reef); Charlotte Rock; Middle Ground to 18 feet depth at mean low water; reef off Barretto Point; deepening approaches to wharves at Davis Island and Willetts Point; Battery Reef; South Ferry Reef; reef off Twenty-sixth Street; and reef off Third Street. The total net increase in the amount required for completing the project resulting from this extra work as given in the annual report for 1908 is $239,950; from later more extended investigation it appears that this amount should be increased by $126,265, or to $366,215.

By act of March 3, 1899, the removal of Man-of-War Reef at an estimated cost of $500,000 was authorized, and the estimate for completion was increased in accordance therewith to $5,639,120.

By the river and harbor act of June 25, 1910, the removal of Middle Ground (H. Doc. 1187, 60th Cong., 2d sess.) to a depth of 26 feet below mean low water, and the making of a channel between North and South Brother Islands (H. Doc. No. 1084, 60th Cong., 2d sess.) were included in the project. The estimated cost for completion is $8,757,183.

The existing project, as modified, provides for the removal of obstructions to the depths given in the following table, and also for constructing two dikes, one connecting Great and Little Mill Rocks and the other closing the channel between Bread and Cheese Reef and Blackwells Island. The construction of the dike at Mill Rocks was completed by the United States in 1882, and the dike at Bread and Cheese Reef was built by the city of New York in 1881.

Table showing work called for under existing project.

Locality.	Distance by water from the Battery.	Least original depth.	Least present depth.	Projected depth.	Remarks.
	Miles.	*Feet.*	*Feet.*	*Feet.*	
Battery Reef	0	12.8	12.8	26	
South Ferry Reef	0	17	19	26	
Diamond Reef	½	15.7	26	26	Completed.
Reef off Diamond Reef	½	19	26	26	Do.
Coenties Reef	½	14.8	25.5	26	
Third Street Reef	3	15.9	26	26	Do.
Shell Reef	2½- 4	7.5	13	18	
Pilgrim Rock	3½	12	24	26	
Twenty-sixth Street Reef	4	16.1	26	26	Do.
Charlotte Rock	4¼	14.7	26	26	Do.
Ferry Reef	4½	7	24	26	
Man-of-War Rock	4¾	+ 0.8	26	26	Do.
Middle Reef (includes Negro Head, Flood Rock, Hen and Chickens, and Gridiron).[1]	7½	+ 6	14.9	26	95 per cent completed.
Heel Tap Rock	7¾	12.1	20.5	26	
Hallets Point Reef	7½	+ 4	26	26	Completed.
Frying Pan Reef	7¾	9	23.8	26	
Pot Rock	8	8	26	26	Do.
Shell Drake Rock	8	8	26	26	Do.
Ways Reef	8½	5	26	26	Do.
Rock off Negro Point	9	--------	--------	26	
Scaly Rock	9½	--------	--------	--------	Reported completed.
Middle Ground [2]	10	11	17.8	26	
Reef off North Brother Island	10¾	16	--------	--------	
Channel between North Brother and South Brother Islands.[3]	10¾-11¼	19	19	26	
Barretto Reef	11¾	17	26	26	Completed.

[1] Under contract for completing removal.
[2] Under contract for part removal.
[3] Under contract for deepening for a width of about 300 feet.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Hell Gate	House	90	Thirty-ninth	Second		
Battery to Hell Gate					1868 [1]	726
Hallets Point in Hell Gate					1875 [2]	Vol. II, 201
Ways Reef in Hell Gate					1875 [2]	Vol. II, 210
Hell Gate					1879 [2]	376
Flood Rock	Senate	[1] 79	Forty-eighth	First		
Flood Rock (progress map)					1885 [2]	735
Shell Reef (Broome St. to 23d St.)	House	[3] 169	Fifty-first	First	1890 [1]	764
Between Battery and Governors Island.[1]	do	834	Fifty-fourth	Second	1897	1182
Battery to Bay Ridge	do	[2] 337	do	do	1897 [1]	1177
Diamond and Coenties Reefs	do	[2] 495	Fifty-sixth	First	1900 [1]	1435
Channel between North Brother and South Brother Islands.	do	[2] 1084	Sixtieth	Second		
Middle Ground off Sunken Meadow	do	[1] 1187	do	do		

[1] No map. [2] Contains map. [3] In two parts; part 2 contains map.

The work accomplished during the year resulted in completing the removal of obstructions from 581,517 square feet of area in Middle Reef, 158,059 square feet in Frying Pan Reef, and 39,600 square feet in Pot Rock, and in drilling and blasting rock in a considerable additional area in Middle Reef. No part of Pot Rock now projects above a plane situated 26 feet below mean low water, and Frying Pan Reef has been removed to the same depth except for possible shoal points situated outside of the area included in the last contract for this work. One such point has been found and further examination is necessary to determine if others exist. Amount expended during the fiscal year, $136,358.96.

The survey of the river was continued throughout the year (see Appendix E 7 of this report) and Great and Little Mill Rocks were purchased for storage purposes.

A report upon a new project for improvement, with maps and estimates of cost, was submitted by the district officer March 2, 1912.

Up to June 30, 1912, $5,219,250.34 had been expended, of which amount $98.02 was for maintenance. There was received from sales of condemned property and maps $1,686.83.

About 67 per cent of the work proposed under the present project has been completed and has resulted in the removal to the projected depth of 26 feet below mean low water of rocks and reefs as shown by the table on page 194 of this report; in the construction of a dike between Great and Little Mill Rocks; and in the partial removal of obstructions at Battery Reef, South Ferry Reef, Coenties Reef, Shell Reef, Pilgrim Rock, Ferry Reef, Middle Reef, Heel Tap Rock, Frying Pan Reef, and Middle Ground. As yet no work has been done toward the removal of the rock off Negro Point. Contracts have been entered into for completing the removal of Middle Reef in Hell Gate, for part removal of Middle Ground off Sunken Meadow, and for dredging the channel between North and South Brother Islands to a width of about 300 feet; all of these to a depth

t of March 3, 1899, the removal of Man-of-Wa
d cost of $500,000 was authorized, and the esti
was increased in accordance therewith to $5,639.
e river and harbor act of June 25, 1910, the re
und (H. Doc. 1187, 60th Cong., 2d sess.) to
ow mean low water, and the making of a cl
nd South Brother Islands (H. Doc. No. 1084.
ere included in the project. The estimated
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existing project, as modified, provides for
ions to the depths given in the following ta
ting two dikes, one connecting Great and I
other closing the channel between Bread and
ells Island. The construction of the dike
ed by the United States in 1882, and the
Reef was built by the city of New York in

Table showing work called for under existin

Locality.	Distance by water from the Battery.	Least original depth.
	Miles.	*Feet.*
eef	0	12.8
ry Reef	0	17
Reef	[illegible]	15.7
iamond Reef	[illegible]	19
Reef	[illegible]	14.3
eet Reef	3	15.9
	2½— 4	7.5
ock	3½	12
ixth Street Reef	4	16.1
Rock	4¼	14.7
f	4½	7
ar Rock	4¾	+ 0.8
Reef (includes Negro Head, Flood	7½	+ 6
en and Chickens, and Gridiron).[1]	7¾	12
Rock	7½	+ 1
oint Reef	7¾	
an Reef	8	
	8	
ke Rock	8½	
f	9	
Negro Point	9¼	
ck	10	
round [2]	10¼	
North Brother Island	10¾-11¼	
between North Brother and South Islands.[3]	11¾	
Reef		

[1] Under contract for completing removal.
[2] Under contract for part removal.
[3] Under contract for deepening for a wi

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the removal of such
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	$802,115.65
	21.25
	802,136.90
, for works of	[1] 136,358.96
	665,777.94
	2,104.16
	663,673.78
t approved July	100,000.00
30, 1913	763,673.78
contracts	555,722.98
riated for completion	[2] 2,773,939.57
in fiscal year ending t	[2] 250,000.00

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ment of $109.33.
vailable for fiscal year 1913.

of 26 feet at mean low water. Work under the contract for completing the removal of Middle Reef has been in progress since April, 1912, and work in Middle Ground and channel between North and South Brother Islands is to be commenced in July, 1912.

On June 30, 1912, the through main channel from the Battery to Long Island Sound had a least depth of 30 feet at mean low water and least width of 550 feet, except in Hell Gate, off Hallets Point, where the width is but about 200 feet for a stretch of about 300 feet. The through channel of 26 feet depth has a least width of 550 feet. Between the limiting lines of the 26-foot channel and the shores, rocky obstructions rise to elevations of 13 to 25½ feet below mean low water. The depths along the pierhead lines in New York and Brooklyn vary from 30 to less than 13 feet, making a large part of these water fronts unavailable for deep-sea commerce.

The mean range of tides in the East River varies according to locality, as follows:

	Feet.
East entrance at Throgs Neck	7.2
North Brother Island Light	6.9
Hell Gate:	
East entrance	6.6
West entrance	5.1
East Forty-first street, Manhattan	4.1
Brooklyn Navy Yard	4.0
The Battery	4.4

The section of the river in which improvements have been made by the removal of obstructions in the order of their importance to the needs of navigation extends from the Battery to Barretto Point, a length, by water, of 11¾ miles. The main navigable channel passes to the west of Blackwells Island, through Hell Gate and to the north of North Brother Island. It extends from the Battery to Throgs Neck at the head of Long Island Sound, a distance of 16 miles, by water.

The traffic in East River is very great, and is intimately connected with that of New York Harbor proper. The aggregate tonnage in the East River section of Greater New York was estimated in 1911 at 45,331,216 short tons. This does not include through traffic. Data secured from reliable sources in 1909 shows that the number of trips through Hell Gate Channel by steamers and tugs of established transportation lines average about 450 daily, and of ferryboats using and crossing the channel about 400 daily. This does not include barges, lighters, and car floats in tow, or privately owned commercial vessels, or yachts. The size of the boats of the transportation lines vary from 50 to 456 feet in length, 12 to 96 feet beam, and 6 to 20 feet draft. Barges and lighters in tow are quite numerous, are of varying dimensions up to 23 feet draft, and are usually made up into tows of three barges each. The car floats are 327 feet long, 40 feet beam, and about 10½ feet draft, and are towed one on each side of a power boat, thus making up a tow of approximately 105 feet wide and 327 feet long. It is reported that about 100 of these car-float tows pass through Hell Gate during each 24 hours.

With the exception of the ferryboats nearly all of this traffic passes through the channel north of North Brother Island in which is situated a reef east of Oak Bluff Light, the subject of numerous complaints urging its removal. The channel is becoming more and more congested with traffic, and the reef complained of has in consequence become a serious menace to navigation. Within the past three years the New York, New Haven & Hartford Railroad Co. has inaugurated a large increase in the ferry slips at Oak Point, and steamers are forced occasionally to stop until tows of car floats are out of the way. The necessities of navigation now demand the early removal of this reef. It is estimated that a depth over it of 26 feet below mean low water can be secured at a cost of $19,000.

More extended remarks in this connection are contained in the report of the district officer, printed as Appendix E 7 of annual report for 1911.

While the benefits derived from the improvement can not be shown by its influence on freight rates or directly by the increase in tonnage, the commerce of the river is so enormous, both in tonnage and value, that every improvement which facilitates and lessens the dangers to navigation in this waterway is unquestionably justified. Perhaps the most obvious effect of the improvement is the increase in the number of vessels of large tonnage using the river.

Improvements in the water front now contemplated by the local authorities, if made, will result in a considerable reduction in rates and in the cost of handling freight. The amount of this reduction will be, to a very appreciable extent, dependent upon the size of channels provided by the United States, and on the depth of water provided outside the pierhead lines.

It is proposed to expend the amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, in continuing the improvement under the existing project by the removal of such part of the rocks and reefs as may be by their removal of the most benefit to navigation.

July 1, 1911, balance unexpended	$802, 115. 65
Received from sales, etc	21. 25
	802, 136. 90
June 30, 1912, amount expended during fiscal year, for works of improvement	[1] 136, 358. 96
July 1, 1912, balance unexpended	665, 777. 94
July 1, 1912, outstanding liabilities	2, 104. 16
July 1, balance available	663, 673. 78
Amount appropriated by river and harbor act approved July 25, 1912	100, 000. 00
Amount available for fiscal year ending June 30, 1913	763, 673. 78
July 1, 1912, amount covered by uncompleted contracts	555, 722. 98
Amount (estimated) required to be appropriated for completion of existing project	[2] 2, 773, 939. 57
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[2] 250, 000. 00

(See Appendix E 7.)

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[1] Includes Treasury settlement of $109.33.
[2] Exclusive of amount available for fiscal year 1913.

8. *Harlem River, N. Y.*—The Harlem River and Spuyten Duyvil Creek, both included in the improvement, are two waterways of a joint length of about 8 miles which join at Kingsbridge, N. Y., and separate Manhattan Island from the mainland.

Before improvement the Harlem River varied in width from about 300 feet to about 1,500 feet, and had an available depth of 10 feet at mean low water from the East River to Morris Dock, except at Highbridge, where it was only 6 feet deep. From Morris Dock to Fordham Landing there was a crooked channel 7 feet deep, and above the latter place to its junction with Spuyten Duyvil Creek the river could be used only by the smallest class of vessels.

The original width of Spuyten Duyvil Creek was about 150 feet at its head and about 1,000 feet near its junction with the Hudson River. It had a least mean low water depth of about 4 feet from Kingsbridge to the Hudson River. Above Kingsbridge the depth gradually diminished to less than 1 foot at the head of the creek. The narrow channel at the junction was obstructed by a ledge of rocks awash at low tide. Improvements by the city of New York within the authorized harbor lines have reduced the width of the river so that its present greatest width, about 900 feet, is near its junction with the East River at Wards Island, and channel improvements by the United States have increased the least widths of 150 feet and 300 feet to a least width of 350 feet.

The East River entrance to Harlem River is situated about 8½ miles, by water, northeast of the Battery in New York City, and the Hudson River entrance at Spuyten Duyvil Creek is situated about 13½ miles, by water, north of the Battery. The Harlem River also connects with the East River by way of Little Hell Gate, a connecting strait between Wards Island and Randalls Island, and Harlem (Bronx) Kills, a similar strait, between Randalls Island and the mainland. The channels in these straits are shoal in places, rocky and winding, and owing to this and to very strong tidal currents they are not used by navigators.

The original project for improvement, adopted in 1874, provided for the removal of old bridge piers, Candle Factory Reef, and bowlders at various places near the East River to a depth of 12 feet at mean low water, the cost of the work being estimated at $167,875.56. In furtherance of this project $21,000 was expended.

The existing project is based on report printed in House Document No. 75, part 9, Forty-third Congress, second session, and as adopted June 18, 1878, provided for a channel from the East River to the Hudson River 15 feet deep at mean low water and 350 feet wide at an estimated cost of $2,100,000. In 1879 the project was modified by increasing the width to 400 feet, except through Dyckmans Cut, where the width was not changed but the depth was increased to 18 feet. The estimated cost of this channel was $2,700,000. Subsequent modifications on October 7, 1886, and on October 2, 1893, reduced the width of the channel in the vicinity of Washington Bridge to 375 feet and 354 feet, respectively. No change was made in the estimated cost. (See Annual Reports of the Chief of Engineers for 1887, p. 671; 1888, p. 598; and 1894, pp. 789 and 790).

The existing project, as modified, provides for making a continuous channel 400 feet wide and 15 feet deep at mean low water from the

East River to the Hudson River, except at Washington Bridge, where the width was made 354 feet, and at the rock cut through Dyckmans Meadow, where the width was reduced to 350 feet and the depth increased to 18 feet. Estimated cost, $2,700,000.

References to examination and survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate	No.	Congress.	Session.	Year.	Page.
Wards Island to Mott Haven Canal.	House	174	Forty-third	First	1874[1]	(Pt. 2) 165
Randalls Island to Hudson River	do	75 (pt. 9)	do	Second	1875[1]	(Pt. 2) 224
Shermans Creek to Hudson River					1876[1]	245
Randalls Island to Hudson River	House	[1] 45	Forty-fifth	Third		
Do.	do	[1] 59	Forty-sixth	Second		
East River via Harlem (Bronx) Kills to Hudson River.[1]	Senate	25	Forty-seventh	First	1882	656
Third Avenue Bridge to Hudson River.					1882[2]	656
Dyckman Cut	House	[1] 210	Fifty-fifth	Third		
Harlem River via Harlem (Bronx) Kills to East River.[1]	do	188	Fifty-eighth	Second	1904	1064

[1] No map.

[2] Contains map.

The work done during the fiscal year consisted in continuing the improvement by dredging and removing rock from the channel below (south of) Willis Avenue Bridge and in dredging the channel between Madison Avenue and Macombs Dam Bridges. This work resulted in increasing the channel of 15 feet depth below Willis Avenue Bridge by about 75 feet, and the channel of 12 feet depth by about 125 feet, and in removing shoals in the west side of the channel between Madison Avenue and Macombs Dam Bridges to a depth of 15 feet for widths up to 225 feet. Amount expended during the fiscal year was $85,463.59.

On June 30, 1912, $1,650,502.27 had been expended on the present project, all for improvement. There was received on account of sale and collections $772.82.

About 60 per cent of the work proposed under the present project has been completed, resulting in making a channel 15 feet deep at mean low water and about 400 feet wide from Willis Avenue Bridge to the Madison Avenue permanent bridge, except immediately north of the easterly pier of the Second Avenue Bridge, where ledge rock projects above the improvement plane; thence to One hundred and forty-fifth Street Bridge the same depth and 400 feet wide, except for a few shoals close to the easterly side of the channel and a few projecting points at sewer outlets in the westerly side of the channel; thence to Macombs Dam Bridge the same depth and 150 feet wide. The available depth through the westerly draw channel at Macombs Dam Bridge is about 12 feet; the channel through the easterly draw opening is not navigable, being obstructed by a rocky ledge which projects above the low-water plane to within a short distance of the fender pier. Below Willis Avenue Bridge, between One hundred and twenty-second and One hundred and twenty-sixth Streets, a few rocks, having a minimum clearance over them of 12½ feet, restricting the clear width of the 15-foot channel to 175 feet; except for these rocks a channel 15 feet deep and 350 feet wide has been formed. Both above and below this section of the river the width rapidly increases to 400 feet and over. In 1907 a channel 15 feet deep and 150 feet wide was dredged from Macombs Dam Bridge to the Hudson River. It is probable that this dredged channel has been narrowed by the filling in of material from the sides. The rock cut through Dyckmans Meadow has been completed.

The maximum draft that could be carried June 30, 1912, through the channel from East River to Hudson River at mean low water is estimated at 15 feet, mainly in about midchannel, except through the navigable (westerly) draw channel at Macombs Dam Bridge, where the depth is but about 12 feet.

The mean range of tides in Harlem River as determined in 1907 is as follows: At Mill Rock, 5 feet; Willis Avenue Bridge, 5.1 feet; Macombs Dam Bridge, 4.7 feet; Broadway Bridge, 3.8 feet; Spuyten Duyvil Bridge, 3.7 feet. The total length of waterway is about 8 miles. The channel has been deepened to 15 feet depth at mean low water throughout this length for widths of 150 to 400 feet, except in the westerly draw channel of Macombs Dam Bridge, where ledge rocks projects to an elevation of 12 feet below mean low water.

The tonnage and value of the commerce of this river, which is general in character, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1895	7,583,594	$203,707,376	1906	11,385,649	(?)$104,359,757
1903	6,910,386	282,186,100	1907	12,385,507	313,380,743
1904	9,130,763	231,384,004	1909	12,822,385	369,099,686
1905	9,998,021	270,210,309	1911	11,751,632	570,494,998

The opening of the Harlem River to navigation has resulted in greatly increasing the areas of Manhattan and Bronx Boroughs, to which heavy freight can be brought by water with a marked saving in cost.

The amount estimated for the fiscal year ending June 30, 1914, is to be applied to continuing the improvement by dredging and rock removal.

July 1, 1911, balance unexpended	$227,189.94
Received from sales, etc	544.20
	227,734.14
June 30, 1912, amount expended during fiscal year, for works of improvement	[1] 85,463.59
July 1, 1912, balance unexpended	142,270.55
July 1, 1912, outstanding liabilities	8,152.90
July 1, 1912, balance available	134,117.65
Amount appropriated by river and harbor act approved July 25, 1912	25,000.00
Amount available for fiscal year ending June 30, 1913	159,117.65
July 1, 1912, amount covered by uncompleted contracts	22,816.85

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[1] Of this amount $69 is a Treasury settlement.

Amount (estimated) required to be appropriated for completion of existing project	[1]$883,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1]100,000.00

(See Appendix E 8.)

9. Harbor at St. Albans, Vt.—The harbor of St. Albans, Vt., is the name applied to the upper end of St. Albans Bay, situated between St. Albans Point and Lime Rock Point, on the northeast shore of Lake Champlain. It is the port for the town of St. Albans, which is situated about a mile and a half inland and connected with the bay by an electric railway.

The harbor may be defined as 1,500 feet of shore line at the head of St. Albans Bay and in its original condition had sufficient depth of water for the commerce using it, this commerce being restricted to such as could pass through "The Gut" (between North and South Hero Islands) where the projected depth is 10 feet at low lake level, but obstructing bowlders in the harbor rendered navigation difficult. The bay is about 2 miles long and 1 mile wide. It has a general depth of from 15 to 21 feet at low lake level and over the worst rock obstructions near the docks of 4½ feet.

The town of St. Albans is essentially a product of the Central Vermont Railroad, and until better means of communication between town and bay are provided there is small likelihood of an extended utilization of water transportation except for passenger carriage.

Burlington Harbor is 35 miles south and Plattsburg Harbor is 20 miles southwest of St. Albans Harbor.

The original project, which is also the existing project, adopted by the river and harbor act of June 25, 1910, in accordance with plan printed in House Document No. 1109, Sixtieth Congress, second session, and not since modified, is to remove to the level of the surrounding bottom all bowlders or other obstructions in the vicinity of the old wharves having a depth over them of less than 6½ feet at low lake level, and also off the steamboat wharf, at an estimated cost of $5,000.

A contract for completing work under this project was entered into November 28, 1911. Owing to the closing of navigation by ice and to high water since the opening of navigation in 1912, the amount of work accomplished during the fiscal year had not resulted in any appreciable benefit to navigation. The amount expended during the year, $505.66, was all for improvement.

Up to June 30, 1912, there had been expended $505.84, all in improvement. This expenditure resulted in completing about 10 per cent of the project.

The maximum draft that can be carried at low lake level over the shoalest part of the area to be improved is 4½ feet. The plane of reference for this harbor is the zero of the United States gauge at Fort Montgomery, N. Y. The extreme variation of level of water surface during the year is generally 6½ feet and the usual variation about 4 or 5 feet. For statement as to extreme rise of lake and lowest record, see under Burlington Harbor, Vt., page 204 of this report.

The head of navigation is at the steamboat wharf.

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[1] Exclusive of amount available for fiscal year 1913.

The tonnage and value of the commerce of this harbor, which is mainly in miscellaneous merchandise, as obtained from the best information available, are as follows:

Year.	Short tons.	Value.
1910	220	$18,000
1911	250	20,000

The principal water transportation is devoted to passenger traffic.

The improvement has not progressed sufficiently to have an appreciable effect on commercial or physical conditions.

July 1, 1911, balance unexpended	$4,999.82
June 30, 1912, amount expended during fiscal year, for works of improvement	505.66
July 1, 1912, balance unexpended	4,494.16
July 1, 1912, outstanding liabilities	19.54
July 1, 1912, balance available	4,474 62
July 1, 1912, amount covered by uncompleted contracts	2,782.38

(See Appendix E 9.)

10. Harbor at Plattsburg, N. Y.—The harbor of Plattsburg, N. Y., is located on the westerly shore of Cumberland Bay, 30 miles southerly from the lower end of Lake Champlain at the international boundary, near Rouse Point, N. Y. Cumberland Bay opens toward the southeast, and Plattsburg Harbor in its original condition was exposed to southeasterly storms. The portion of the harbor now used as such is about 1,500 feet long, varies in width from about 500 feet to about 1,400 feet, and contains about 25 acres. The available depth varies from 6 feet at the wharves to a maximum of 17 feet in the protected area. Saranac River empties into Lake Champlain immediately north of and adjacent to the most northerly wharf in the harbor. Its source is situated about 42 miles southwest of Plattsburg. The river is navigable by light draft boats from its mouth up to a dam, a length of about one-half mile.

Burlington Harbor is about 20 miles by water, southeast of Plattsburg Harbor.

The city of Plattsburg is a growing manufacturing town, with much water front not now developed but susceptible of development for wharfage. On the opening of the new Champlain Canal this harbor should become an important commercial factor.

The original, which is also the existing, project for improvement, adopted by the act of July 4, 1836, was to build a breakwater or pier (estimated cost unknown). In 1870 the project was modified by providing for an extension of the breakwater 400 feet in a northerly direction, the dredging of shoals, and the revetment of the United States land (this latter work has not been undertaken, as the object sought can be obtained more economically by periodical dredging), the estimated cost at that time being $65,000. The river and harbor act of September 19, 1890, again modified the original project by providing for the further extension northerly of the breakwater 300 feet and the replacement of the timber superstructure with stone, the estimated cost of this additional work being $32,500. The river and harbor act of June 13, 1902, appropriated, without previous estimate, $5,000 for maintenance and restoration. The river and harbor act of June 25, 1910, appropriated $25,500, the full amount of the estimated cost of completing the existing project, in accordance with report printed in House Document No. 759, Sixty-first Congress, second session, by dredging to the depth of 9 feet at low lake level the shoal between the breakwater and the wharves, redredging the channel in front of the wharves, and repairing the breakwater, including rebuilding the superstructure of the timber piers with stone. The existing project, as modified, provides for a breakwater 1,565 feet long and for dredging to a depth of 9 feet at low lake level between the breakwater and the wharves.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Plattsburg Harbor	House	[1] 89	Thirty-ninth	Second	1867 [1]	249
Do	do	[1] 15	Forty-seventh	do		
Do	do	[1] 34	do	do		
Mouth of Saranac River	do	[2] 72	Forty-eighth	do	1885 [2]	2819
Plattsburg Harbor					1887 [2]	2406
Do					1889 [1]	2458
Mouth of Saranac River	House	[1] 22	Fifty-first	Second	1891 [1]	2938
Plattsburg Harbor	do	[1] 759	Sixty-first	do		

[1] Without map. [2] With map.

Work under a contract for dredging was commenced late in June. The amount of work accomplished by the close of the fiscal year was too small to be of any material benefit to navigation. Bids for repairing the breakwater will be opened July 25, 1912. Amount expended during the fiscal year was $735.16, all for improvement.

On June 30, 1912, $191,110.77 had been expended on this project. The portion of the expenditure applied to maintenance can not be ascertained. There was received from sales $0.50.

About 92 per cent of the work proposed under the original project has been completed and has resulted in the construction of a breakwater 1,565 feet long and the creation of a protected harbor behind it. The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality under improvement is about 6 feet at low lake level. A draft of about 10 feet can be carried at low lake level to parts of the steamboat landing; elsewhere the depth varies from 6 feet at the wharves to 17 feet within the area protected by the breakwater. The plane of reference for this harbor is low lake level, as shown by the zero of the United States Engineer gauge at Fort Montgomery, N. Y. The extreme annual variation of level of water surface is generally 6½ feet and the usual variation about 4 or 5 feet. For statement as to extreme rise of lake and lowest recorded, see under Burlington Harbor, page 204, of this report. The head of navigation is at the lowest dam in the Saranac River, about three-fourths of a mile from deep water in the harbor.

The commerce within the limits of the improvement, mainly in miscellaneous merchandise, as obtained from the best available information, is as follows:

	Short tons.
1904	261,107
1908	253,429
1909	257,950
1910	260,185
1911	262,075

NOTE.—These statistics require explanation, for which see Appendix E 10 of this report.

The improvement has resulted in the establishment and maintenance of competition with the railroad, which is believed to have influence in equalizing freight rates. The effectiveness of water competition is neutralized, in part, at least, by inadequate privately owned terminals, believed to be controlled by the railroad.

The present condition of the breakwater is such that the necessity for repairs in addition to those under funds now available is anticipated, and the additional appropriation recommended for the fiscal year 1914 will be applied to that purpose and to maintenance and dredging.

Owing to changes in local conditions since the existing project was adopted, the local officer is of the opinion that certain modifications of the plan of improvement would be desirable, and a reexamination of the locality is therefore recommended.

July 1, 1911, balance unexpended	$25,413.28
Received from sales, etc	.50
	25,413.78
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	735.16
July 1, 1912, balance unexpended	24,678.62
July 1, 1912, outstanding liabilities	488.88
July 1, 1912, balance available	24,189.74
July 1, 1912, amount covered by uncompleted contracts	8,633.87
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 4,000.00

(See Appendix E 10.)

11. Harbor at Burlington, Vt.—The harbor of Burlington, Vt., is a half-moon-shaped bay on the eastern shore of Lake Champlain, about 41 miles from the foot of the lake. Before improvement there was ample depth of water along the docks and wharves, but they were without protection against wind and seas from Lake Champlain. In the greatest exposure during the prevalent northwesterly gales the wind has a sweep obliquely across the lake of about 10 nautical miles.

The harbor may be defined as 1½ miles of shore line along the eastern shore of Lake Champlain, protected by a breakwater 4,157 feet long at an average distance of about 1,000 feet from the shore. The depth at the face of the wharves is from 9 to 15 feet at low lake level, increasing to 25 and 30 feet within the protected area.

Plattsburg Harbor, N. Y., is 20 miles, by water, northwest from Burlington Harbor.

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[1] Exclusive of the balance unexpended July 1, 1912.

Burlington is a city of about 40,000 population, traversed by two railroads. Its harbor facilities can be extended as business requires, and on the opening of the new Champlain Canal this harbor should become a very important commercial factor.

The original project, adopted by the act of July 4, 1836, was to build a breakwater parallel with the shore and about 1,000 feet from the docks and wharves.

This project was modified in 1867 and 1874, these modifications providing for changes in plan and extensions of the breakwater. Under the original project and its subsequent modifications the amount expended for construction prior to the adoption of the project of 1886 was $501,811.07, with which 3,551 feet of breakwater were built.

The existing project, adopted in 1886, is to extend the breakwater 1,500 feet (500 feet northerly and 1,000 feet southerly), at an estimated cost of $150,000, enlarged in 1894 and 1902 to embrace repairs and replacing the crib superstructure (3,833 feet) with one of stone or concrete, at a cost estimated at $173,750, a total of $323,750, increased in 1910 to $385,355.

In the execution of this work it developed that through deterioration of the timber cribs the substructure on the lake face of the breakwater for a distance of 1,165 feet is in a serious condition as to stability.

The existing project, as modified, provides for a northerly extension 500 feet long and a southerly extension 1,000 feet long, to the main breakwater, leaving an opening 200 feet wide between the main breakwater and the northerly extension; for replacing the decayed timber superstructure with one of stone or concrete; and for protecting the timber cribs of the substructure on the lake face of the breakwater for a distance of 1,165 feet with a rubble mound carried up to low lake level.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Harbor	Senate	42	Thirty-fifth	First	1866[1] Appendix KK.	179
Do					1867[1]	251
Breakwater modification					1874[1]	274
Harbor					1897[2]	3298
Breakwater repairs and maintenance					1901[1]	1072

[1] No map.

[2] Contains map.

Minor repairs were made to the breakwater during the year at a cost of $357, and a contract was entered into for building a rubble mound on the lake face of a section of the breakwater where the substructure is failing. Amount expended during the year $1,352.

On June 30, 1912, $240,573.86 had been expended on the project, of which amount $35,783.37 was for maintenance. There was received from sales $147.45.

About 68 per cent of the project has been completed. As the result of this expenditure 606 feet (364 feet northerly and 242 southerly) of the total extension of the breakwater has been completed, giving a total length of 4,157 feet of breakwater; 3,567 linear feet of the superstructure have been rebuilt; and extensive repairs have been made to the substructure, the necessity for which repairs was not foreseen until the old superstructure was removed.

In its present condition the breakwater renders the commercial use of the harbor possible. No shoaling has taken place in the vicinity of the docks, the chief obstruction to navigation being in the form of a dilapidated submerged dike running out from shore toward the southerly end of the breakwater.

The plane of reference for this harbor is low lake level, as shown by the zero of the United States Engineer gage at Fort Montgomery, N. Y.

The extreme variation of level of water surface is generally 6½ feet and the usual variation about 4 or 5 feet. Extreme rise of the lake, following spring rains and melting of snow, culminates in April or May. It seldom fails to reach a gauge height of 5 feet and rarely exceeds 8 feet. The highest recorded is 8.8 feet in March, 1903. Lowest stage generally occurs in September or October, but has occurred as early as July and as late as February. Lowest recorded is —0.6 in November, 1908. Gauge is located at Fort Montgomery, N. Y. The head of navigation in this harbor is at the wharves in the lee of the breakwater.

The tonnage of this harbor, mainly in miscellaneous merchandise, as obtained from the best available information, is as follows:

	Short tons.
1904	107,421
1908	91,374
1909	78,935
1910	90,000
1911	100,000

The water-borne commerce of this port during gales is practically dependent for its existence upon the protection afforded by the breakwater.

The amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, is to be applied to work of maintenance.

July 1, 1911, balance unexpended		$58,779.14
Received from sales, etc		1.45
		58,780.59
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$490.00	
For maintenance of improvement	862.00	
		1,352.00
July 1, 1912, balance unexpended		57,428.59
July 1, 1912, outstanding liabilities		165.00
July 1, 1912, balance available		57,263.59
Amount appropriated by river and harbor act approved July 25, 1912		2,000.00
Amount available for fiscal year ending June 30, 1913		59,263.59
July 1, 1912, amount covered by uncompleted contracts		55,500.00

Amount (estimated) required to be appropriated for completion of existing project	[1] $123, 323. 37
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 2, 000. 00

(See Appendix E 11.)

12. Narrows of Lake Champlain, N. Y. and Vt.—The Narrows of Lake Champlain is that portion of the lake at its upper end included between Whitehall and Crown Point. The portion covered by the project for improvement is the southern 15 miles of the waterway from Whitehall to Benson Landing, Vt. In its original condition the channel was narrow and tortuous with a ruling depth of from 9½ to 10 feet at low lake level and a width probably between 75 and 200 feet.

From the foot of the canal to Whitehall to the head of Lake Champlain at Crown Point the navigable length of the Narrows is 37 miles. From Whitehall navigation is continued to the Hudson River and Erie Canal by the Champlain Canal, which is 61 miles long, from the southern extremity of the Narrows at Whitehall to Waterford, N. Y., making the Narrows a connecting link in an international highway for water-borne commerce between New York City and Canada.

Plattsburg Harbor, N. Y., is 87 miles by water, and Burlington, Vt., is 71 miles by water, north of Whitehall, N. Y. New York City is 214 miles south.

The original project, adopted by the act of August 5, 1886, was to obtain, by dredging and by a small amount of rock excavation, a channel with a least width of 150 feet and depth of 12 feet at low lake level from Whitehall to deep water below Benson Landing, a distance of 15 miles. On the original project (as extended in 1890 to widen and straighten the middle reaches of the channel) the amount expended prior to operations under existing project was $63,500.

The existing project, adopted by the act of March 3, 1899, is to widen the channel and restore it to the depth of 12 feet at low lake level in five localities; also to provide fenders for protecting barges from collision with the rocky banks of the channel at Puts Rock, the Narrows, and Pulpit Point, at an estimated cost of $22,500. This project was completed, without modification, in 1905. Subsequent expenditures have been applied to maintenance of the improvement.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Whitehall Harbor to Bensons Landing.[3]	House	188	Forty-eighth	Second	1885	2310
Four channels [2]	do	211	do	do	1885	2314
Whitehall to Bensons Landing (modification and estimate).					1897 [3]	3302

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[1] Exclusive of amount available for fiscal year 1913. [2] Contains map. [3] No map.

Under a contract for dredging in Whitehall Harbor work had not been commenced at the close of the fiscal year. The expenditures during the year, amounting to $664.29, were in payment of the cost of a survey made preliminary to advertising for proposals for dredging, and in part payment of office expenses, advertising, printing, and contingencies.

On June 30, 1912, $25,503.96 had been expended on the existing project. The portion of this amount expended for maintenance is not definitely known, but is estimated at $3,003.96. There was received from sales $1.50.

The project has been completed. On June 30, 1912, the maximum available draft over the shoalest part of the locality under improvement is 10 feet at low lake level. The extreme variation of level of water surface is generally 6½ feet, and the usual variation about 4 or 5 feet. For statement as to extreme rise of lake and lowest recorded, see under Burlington Harbor, page 204 of this report.

The improvements have been made in a section about 15 miles long. The head of navigation of the improved section is at Whitehall, N. Y. Navigation is, however, continued southward from Whitehall to the Erie Canal and the Hudson River via the Champlain Canal and northward to the St. Lawrence River via Lake Champlain, the Richelieu River, and Chambly Canal.

The commerce within the limits of the improvement, mainly in general merchandise, coal, pulp wood, and building material, as obtained from the best available information, is as follows:

Year.	Short tons.
1907	724,529
1908	565,414
1909	625,604
1910	674,683
1911	825,975

The effect of the work done under the project has been to reduce the cost of operation to navigation companies, which has resulted in a reduction of freight rates and increased business. This waterway is an important factor in regulation of railroad rates. Rates unfavorable to water transportation are due to the small size of boats carrying freight through old canal and to poor terminal facilities at all lake ports. Both of these causes will be removed by State and municipal works nearing completion or contemplated.

The amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, is to be applied to maintenance of the improvement by dredging and repairs to fender booms.

It is expected that report upon preliminary examination, directed by the river and harbor act of June 25, 1910, will be submitted to Congress at its next session.

July 1, 1911, balance unexpended	$4,160.33
Received from sales	1.50
	4,161.83
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	664.29
July 1, 1912, balance unexpended	3,497.54
Amount appropriated by river and harbor act approved July 25, 1912	6,000.00

Amount available for fiscal year ending June 30, 1913	$9,497.54
July 1, 1912, amount covered by uncompleted contracts	2,950.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 6,000.00

(See Appendix E 12.)

13. Hudson River, N. Y.—The name Hudson River as here used applies to the portion of the upper river from Waterford as far south as improvement in the interests of navigation is necessary.

In its original condition the portion of the Hudson River which was selected for improvement by the General Government was a narrow and crooked channel between banks 650 to 3,000 feet apart, with a navigable depth at mean low water of 3½ to 4 feet between Waterford and Albany; of 7½ feet between Albany and New Baltimore; of 11 feet between New Baltimore and Coxsackie, and 12 feet and more between Coxsackie and New York City. The river was obstructed by sand bars which rendered the channel tortuous and unstable.

Under these conditions the river was navigable by small light draft vessels only, though its commercial importance was great.

Railroads, though being built, were negligible as competing carriers, and the river furnished the chief outlet for the cities of Albany and Troy and the southern connection of the Champlain and Erie Canals, opened in 1822 and 1827, respectively. At Waterford these canals had an outlet into the Hudson in the pool formed by the State dam at Troy, completed about 1823.

The source of the Hudson River is located in the Adirondack Mountains about 300 miles from the Battery in New York City. It flows in a general southerly direction, and north of Troy is joined by the Hoosick and Mohawk Rivers, and many smaller streams, and drains an area of about 13,000 square miles. The length of the section included in the project is about 39 miles, and the lower end of the project is 117 miles from the mouth of the river at the Battery in New York City.

The river has been under improvement by the United States since 1834.

Prior to the adoption of the existing project, this work has been done under several projects and modifications thereof as follows:

The original project for improvement, adopted in 1834, was based on a survey made by Mr. De Witt Clinton, Jr., published in House Document No. 189, War Department, Twenty-second Congress, first session. This survey covered the reach from Waterford to near New Baltimore. As modified in 1852 and again in 1866, it had for its object the securing of a navigable channel of sufficient width and 9 feet deep at mean low water between Troy and Albany, and 11 feet deep between Albany and New Baltimore. In carrying out this work $1,667,938 was expended.

A second project, in accordance with plan printed in House Executive Document No. 23, Fifty-second Congress, first session, was adopted July 13, 1892, and was modified March 3, 1899. It provided for a 12-foot channel at mean low water 150 feet wide from the State dam to the foot of Jacob Street, Troy; thence gradually increasing in width to 400 feet at the foot of Broadway, Troy; thence 400 feet wide to Coxsackie. This work was estimated to cost $4,343,863.

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[1] Exclusive of amount available for fiscal year 1913.

Though not so reported, the project of 1892 was practically completed and work under it was abandoned and the balance of funds on hand applied to work under the existing project at the time the latter was adopted.

The total sum expended for improvement and maintenance prior to the date of adoption of the existing project is $5,466,752.32.

The existing project, which has not been modified, was adopted by the river and harbor act of June 25, 1910.

It provides for a channel 12 feet deep at all stages from deep water in the lower river to Waterford. This requires the improvement of the existing channel between Hudson and Waterford, a distance of 39 miles.

This project is in accordance with plan printed in House Document No. 719, Sixty-first Congress, second session, and provides for the construction of a new lock and dam to replace the existing State lock and dam at Troy, N. Y., about 1,400 feet north of the said lock and dam; the construction of such work or works appurtenant to the dam as may be necessary for the development, use, and sale of surplus water for power; the granting of leases for the occupation of land belonging to the United States; the removal of the State lock and dam; and the excavation of a channel 12 feet deep at all stages, to be 200 feet wide from above the dam to Waterford; the general width below the dam to be 400 feet except in front of the cities of Troy and Albany, where it is to widen so as to form a harbor at each of these localities. Below the Congress Street Bridge the channel narrows to the proposed general width of 400 feet, which general width, with due increase of width at bends, is to be maintained to deep water in the Hudson River. Estimated cost, $5,186,064. It was intended to complete the said improvement within a period of four years, subject to the provisions stated in the document above referred to.

The requirement that the depth shall be 12 feet at all stages necessitated the establishment of new planes of reference for channel depths, those of lowest water, to take the place of the assumed planes of mean low water from which the depths of the earlier projects have been reckoned. These planes of lowest water have been assumed from the recorded planes of lowest water corrected for the changes in tidal regimen and surface slopes which the new and deeper channel will cause.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Waterford to New Baltimore	House	189	Twenty-second.	First		
Waterford to point below Albany	do	2	Twenty-fourth.	do		
Troy Dam to New Baltimore	do	58	Twenty eighth.	do		

References to examination or survey reports and maps or plans not in project documents—Continued.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Troy Dam to Hudson	House	[1] 1	Thirty-third	First		
Troy to New Baltimore					1866 [1]	206
Above Troy to Albany [1]	Senate	19 (Pt. I)	Forty-third	Second	1875 (Pt. II)	585
New Baltimore to Coxsackie [2]	House	206	Fiftieth	First	1888	640
Great Lakes to Hudson River at Coxsackie.	do	1023	Fifty-second	do		
New York City and State dam at Troy.[2]	do	23	do	do	1892	750
Great Lakes to Hudson River at Albany.	do	[2] 231	Fifty-fourth	Second	1897	3250 3324
Great Lakes to navigable waters of the Hudson River.	do	[2] 86	Fifty-fifth	First	1897 [1]	3128
Albany to Coxsackie		[1] 307	Fifty-eighth	Second	1904 [1]	1082
Troy to Waterford		[2] 539	Fifty-ninth	do		
Waterford to Hudson		[2] 719	Sixty-first	do		

[1] No map.

[2] Contains map.

The requirement of the river and harbor act of June 25, 1910, that the existing water-power rights should be extinguished having been complied with by the action of the New York State Canal Board, under date of November 22, 1910, the preparation of detail plans for the work was carried on until notice of the rescinding of that resolution by that board, the personnel of which had been changed, was received under date of April 28, 1911, after which all work was suspended, except the work incident to the carrying on of a contract previously made for rock removal, dated February 3, 1911, and the work necessary for maintenance.

Under date of September 15, 1911, the Secretary of War directed the resumption of work on such portions of the project as were not dependent upon the construction of the lock and dam, and under date of February 17, 1912, instructions were received that all work under the project be resumed. On March 1, 1912, the final location of the dam, as originally recommended in House Document 719, Sixty-first Congress, second session, was approved by the Secretary of War, as required by the terms of the act adopting the project.

The work done during the year consists of the preparation of detailed plans and specifications for the construction of the new lock and dam at Troy, N. Y., and new dikes; plans and experimental work for raising crest of old dikes; the letting of contracts for the construction of new dikes; the furnishing of material and the construction of plant for repairing and raising of old dikes and the commencement of this work; the maintenance of the improvement by repairing old dikes; the removal of rock from the channel; the construction of new dikes under contracts; and the enforcement of the navigation laws.

During the fiscal year the sum of $109,478.01 was expended. Of this amount $7,955.05 was spent for work of maintaining existing dikes built under former projects.

The total amount expended under the existing project prior to June 30, 1912, is $147,192.78, of which amount $21,238.01 was expended for maintenance. There was received from sales, etc., $297.41.

The proportion of the approved project accomplished up to June 30, 1912, is about 3 per cent.

The maximum draft that can be carried at lowest low water is 8.5 feet.

The range of the tides in seasons of moderate rains varies from 2.55 feet at the State dam to 2.89 feet at Broadway, Troy, 2.84 feet at Albany, to 3.69 feet at Coxsackie, and 4.10 feet at Hudson, being an increase in elevation of high water of about one-half foot at Albany above that found by observation in 1876. Spring freshets range generally from 12 to 17 feet, and frequently the water in the river remains for a week or more at a time at height of 8 feet above lowest low water. The greatest known freshet during the navigation season was that of October, 1869, due to the great rainfall in that month (13.8 inches), which brought the river level to 21 feet above lowest low water at Albany, N. Y.

For results of previous tidal observations reference is made to the report of the Chief of Engineers for 1897, page 998, and 1900, page 1490.

The length of the section under improvement is about 39 miles.

The head of navigation for present tidal portion of the river is at the State dam, 153 miles north of the Battery in New York City. Above the dam the river is navigable and navigated to Waterford and from there is connected by canal with the Great Lakes and with Lake Champlain. The total length of the navigable river from Waterford to the Battery at New York City is 156 miles.

The commerce within the limits of the improvement, mainly in general merchandise, farm products, building material, fuel, and ice, as obtained from the best available information, is as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1908	2,945,921	$120,421,651	1910	5,033,200	$109,941,000
1909	3,254,423	237,214,824	1911	4,241,478	92,100,312

During the season of navigation a large volume of traffic follows the railroad only because of lack of water transportation. The improvement accomplished so far has resulted in the establishment of an increasing passenger and freight packet business between the upper Hudson and New York. A direct result of the improvement has been to install in this service the largest river steamers to-day afloat in the United States, and in anticipation of benefits to be derived from the existing project two new steamboats, larger than their predecessors and stated to cost about $1,250,000 each, are under construction.

The service of these steamers has resulted in strong competition with the railroads, by which freight rates are maintained within bounds. The status of water-borne freight traffic is at present unstable in view of the plans on foot for the development of traffic on the opening of the New York State Barge Canals and the further improvement of the river contemplated in the present project.

It is proposed to apply the amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, to continuing the improvement by dredging, rock removal, and dike raising and repair, and to emergency dredging for channel maintenance where required for relief of navigation. The work proposed is necessary to make the improvement available.

July 1, 1911, balance unexpended		[1] $2,062,313.15
Received from sales, etc		269.49
		2,062,582.64
June 30, 1912, amount expended during fiscal year:		
For works of improvement	[2] $104,731.18	
For maintenance of improvement	4,746.83	
		109,478.01
July 1, 1912, balance unexpended		1,953,104.63
July 1, 1912, outstanding liabilities		26,029.06
July 1, 1912, balance available		1,927,075.57
July 1, 1912, amount covered by uncompleted contracts		554,504.52
Amount (estimated) required to be appropriated for completion of existing project		[3] 3,104,093.84
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[3] 1,560,000.00

(See Appendix E 13.)

14. *Saugerties Harbor, N. Y.*—Saugerties Harbor, about 6,000 feet long and about 200 to 500 feet wide, situated about 100 miles by water above the Battery, New York City, is the name applied to the mouth of Esopus Creek, which has its source in the Catskill Mountains, about 25 miles west of Saugerties. The creek is navigable at high water to a dam and rapids situated about 6,000 feet from deep water in the Hudson River. The original depth at mean low water over a bar at the mouth of the creek was 3 feet, which had been increased by dredging to a depth of 7.5 feet and a width of 100 feet by the State of New York, in 1885–86, prior to improvement by the United States.

When the original project for improvement was adopted vessels drawing 10.5 feet could navigate the harbor at ordinary high water with safety.

The width at the mouth of Esopus Creek before diking was about 1,200 feet, and the creek was navigable for a distance of about 4,000 feet.

The original project, which contemplated securing a permanent channel 7 feet deep at mean low water and 100 feet wide, at an estimated cost of $52,000, was adopted in 1884, modified in 1887, and completed in 1892, with an expenditure of $42,000. To June 30, 1902, $15,000 had been expended for maintenance.

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[1] The balance unexpended as shown by report for 1911 was in error, and should have been $2,062,313.15, instead of $2,069,463.43.

[2] Of this amount $205 is a Treasury settlement.

[3] Exclusive of the balance unexpended July 1, 1912.

The existing project is based on report printed in House Document No. 107, Fifty-sixth Congress, first session, and was adopted June 13, 1902. It provides for a channel 12 feet deep at mean low water and 200 feet wide from deep water in the Hudson River to the steamboat landing, at an estimated cost of $44,685, with an estimated annual expenditure of $2,500 for maintenance. This project has not been modified.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Saugerties, N. Y.	Senate	[1] 57	Forty-eighth	First	1884 [2]	716
Do	House	[1] 107	Fifty-sixth	do	1900 [2]	1518
Do					1904 [1]	1046

[1] Contains map.

[2] No maps.

The work done during the fiscal year resulted in making a channel, by dredging, not less than 12 feet deep at mean low water and 200 feet wide from deep water in the Hudson River to the steamboat landing, except for a length of about 75 feet, where a small ledge uncovered by the dredging reduces this width to about 125 feet. Amount expended during the fiscal year $10,054.19, all in improvement.

Up to June 30, 1912, $58,450.53 had been expended on the present project; of this amount $21,332.45 was for maintenance. There was received from sales $4.60.

The expenditure for maintenance is mainly due to restoring the channel above the reef, where, owing to the breaking of the dam a short distance above the head of navigation in the summer of 1902 and the consequent release of a large quantity of mud and silt retained by it, the channel had been reduced in width and depth so as to be practically closed to navigation by large boats, and to the relief to navigation along the wharves on the north side of the channel, where extensive shoaling had taken place, apparently as the result of the removal of the rock off Barclays Point.

About 80 per cent of the existing project has been completed and has resulted in making a through channel of a width of 125 to 200 feet, permitting a maximum draft at mean low water of 12 feet as far as the steamboat landing. The length of the improved section is about 0.82 of a mile. The head of navigation is about 6,000 feet west of the Saugerties Lighthouse, but there is little navigation beyond the steamboat landing, which is located on the south bank of the creek about 4,000 feet from the lighthouse.

The tonnage and the value of the commerce of this harbor, mainly in building materials, manufactures, farm products, and general merchandise, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1901	67.473		1907	95,400	$1,878,000
1902	66,500		1908	114,000	2,070,500
1903	112,677		1909	125,100	2,177,000
1904	113,200	$18,832,195(?)	1910	69,546	2,649,750
1905	81,600	1,598,000	1911	147,494	2,648,000
1906	83,300	1,606,200			

The effect of the improvement, according to the best information available, has been to reduce freight rates during the season of navigation.

It is proposed to apply the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, to continuing the improvement and to maintenance, by removal of rock, building, repairing and extending dikes where necessary, and dredging.

July 1, 1911, balance unexpended	$12,108.26
June 30, 1912, amount expended during fiscal year, for works of improvement	[1] 10,054.19
July 1, 1912, balance unexpended	2,054.07
Amounted appropriated by river and harbor act approved July 25, 1912	2,500.00
Amount available for fiscal year ending June 30, 1913	4,554.07
Amount (estimated) required to be appropriated for completion of existing project	[2] 5,517.45
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[2] 2,500.00

(See Appendix E 14.)

15. Harbors at Rondout and Peekskill, N. Y.—(*a*) *Rondout Harbor.*—This harbor, about 3 miles long and 300 to 1,000 feet wide, is in the mouth of Rondout Creek, located on the west shore of the Hudson River, about 90 miles north of the Battery, New York City. The portion under improvement extends between dikes about one-half of a mile from the entrance to the creek proper, at the shore line, across the flats on the west side of the Hudson to the navigable channel of the river. In its original condition before the improvement was begun this reach was a wide flat through which a channel 7 feet deep at the adopted plane of mean low water and about 400 feet wide had been formed as a result of work done by private parties.

Rondout Creek has its source in Sullivan County, N. Y., about 30 miles southwest of the city of Kingston. The Wallkill River, the source of which is in Sussex County, N. J., about 65 miles south-southwest from Kingston, empties into Rondout Creek about 5 miles above the mouth of the latter. The creek is navigable up to a tide lock at Eddyville, 3 miles from its mouth, and at one time was the easterly section of Delaware & Hudson Canal. It is the outlet by water for Rondout and Kingston, N. Y., and the home port of the principal fleet of towboats operating on the Hudson River.

The original project for improvement, which is also the existing project, is based on report printed in Senate Document No. 35, Forty-second Congress, second session. It was adopted June 10, 1872, and provides for a channel across the mud flats at the mouth of the creek about 3,000 feet long, 14 feet deep at mean low water, and 100 feet wide, by dredging and dike construction, at an estimated cost of $172,500. The project was completed, without modification, in 1880 at a total cost of $90,000. Since then the expenditures have been for maintenance.

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[1] Of this amount $236.74 is a Treasury settlement.
[2] Exclusive of amount available for fiscal year 1913.

Reference to examination and survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No	Congress.	Session.	Year.	Page.
Mouth of Rondout Creek					1869 [1]	[illegible]
Eddyville to mouth of creek	Senate	[1] 85	Forty-second	Second	1872 [1]	810
Mouth of Rondout Creek					1880 [2]	494
Do					1885 [2]	697
Do					1895 [1]	913
Do					1908 [2]	884

[1] No map.

[2] Contains map.

The work accomplished by the expenditure during the year was the rebuilding of 120 feet and the partial repairs of about 200 feet of the south dike under contract, and a resurvey of the harbor. Amount expended during the fiscal year $2,786.49, all in maintenance of improvement.

Up to June 30, 1912, $143,976.32 had been expended on the project. Of this amount $53,976.32 was for maintenance.

The project has been completed by the construction of a north and a south dike at the entrance, a channel about 3,000 feet long, 100 feet wide, and 14 feet deep at mean low water. The maximum draft that could be carried through the improved channel on June 30, 1912, was 13 feet at mean low water, with a least width of channel of about 75 feet. Above this the depth in the natural channel to Eddyville, situated about 3 miles above the mouth of the creek, is estimated at 8 feet. The length of the improved section is about 3,000 feet. The head of navigation in the creek is at the tide lock of the Delaware & Hudson Canal in Eddyville, N. Y. The mean range of tides is 3.9 feet.

The tonnage and value of the commerce of this harbor, mainly in general merchandise, building and shipbuilding materials, manufactures, and fuel, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1904	1,469,000	$41,065,000	1908	436,000	$2,075,000
1905	1,825,000	46,112,500	1909	440,000	1,820,000
1906	998,524	5,610,900	1910	506,015	4,851,030
1907	1,255,000	5,025,000	1911	510,671	3,355,884

The decrease in commerce since 1905 is mainly due to the removal of the Delaware & Hudson Canal terminus.

The effect of the improvement has probably been to keep the freight rates down during the season of navigation.

It is proposed to apply the amount required for expenditure during the fiscal year ending June 30, 1914, to maintenance, by rebuilding and repairing and extending the south dike and repairing north branch dike, and by dredging for relief of navigation if found necessary. The dike extension is necessary to maintain depths at the entrance, as described in Appendix E 15 of this report.

July 1, 1911, balance unexpended	$7,610.17
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,786.49
July 1, 1912, balance unexpended	4,823.68
July 1, 1912, outstanding liabilities	928.34
July 1, 1912, balance available	3,895.34
Amount appropriated by river and harbor act approved July 25, 1912	11,000.00
Amount available for fiscal year ending June 30, 1913	14,895.34
July 1, 1912, amount covered by uncompleted contracts	3,722.59
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

(*b*) *Peekskill Harbor.*—This harbor is an indentation on the eastern shore of the Hudson River, about 42 miles above the Battery, New York City. It is about five-eighths of a mile long and 1¼ miles wide, and before improvement had a controlling depth of about 5 feet at mean low water, except near the wharves in Peekskill, where the depth was about 6 feet. Peekskill Creek empties into the harbor about one-half mile northwest of the wharves. The mouth of the creek to Annsville is referred to locally as Annsville Creek, and the upper section, above the highway crossing at Tompkins Corners, as Peekskill Hollow Creek. The mouth of the creek is crossed by a trestle bridge containing a draw span built by the New York Central & Hudson River Railroad. Its source is situated about 14 miles northeast of Peekskill.

Improvements by the United States are limited to the maintenance of a channel in the harbor completed by dredging in 1899.

The original project for improvement, adopted June 3, 1896, is based on report printed in House Document No. 37, Fifty-third Congress, third session. It provided for a channel 10 feet deep at mean low water and 100 feet wide from deep water in the Hudson River north of the village to deep water south of it, following generally the contour of the shore, at an estimated cost of $50,000. This project was modified in 1896 (Annual Report of the Chief of Engineers for 1896, p. 839) by providing for two turning basins 200 feet by 150 feet, of the same depth, in front of the center and lower wharves. No change was made in the estimate of cost. The project, as modified, was completed in 1899 at a cost of $19,400.

The existing project, as modified, provides for a dredged channel 10 feet deep at mean low water and 100 feet wide from deep water in the Hudson River north of the village to deep water south of it, following generally the contour of the shore, and two turning basins 200 feet by 150 feet, of the same depth, in front of the center and lower wharves. Estimated cost, $19,400.

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[1] Exclusive of amount available for fiscal year 1913.

Reference to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No	Congress.	Session.	Year.	Page.
Harbor from wharves to deep water, Hudson River.	Senate	[1] 57	Forty-eighth	First	1884 [2]	718
Do.[2]	House	87	Fifty-third	Third	1895	999
Opposite center and lower wharves					1896 [2]	839
Harbor from wharves to deep water, Hudson River.					1903 [1]	885

[1] Contains map. [2] No map.

During the fiscal year the channel was restored to its projected width and depth by dredging, except for a length of about 600 feet and width of 50 feet in the easterly side of the channel south of Center Wharf, where deposits had been made by a sewer and surface drain situated immediately south of Center Wharf. The required depth in the turning basins has been maintained without redredging. Amount expended during the fiscal year, $1,494.86.

Up to June 30, 1912, $30,112.77 had been expended on the project; of this amount $10,712.77 was for maintenance. There was received from sales $1.90.

The project was completed in 1899 by dredging a channel of the projected width and depth; a turning basin in front of Center Wharf; and widening at the bends. The turning basin in front of the lower wharf was included in the area dredged in the widening of the bend at that place.

On June 30, 1912, a maximum available draft of 10 feet at mean low water existed throughout the entire length of the improved channel and for full projected width including the turning basin and widening at the bends, except for a length of about 600 feet in the easterly side of the channel, south of Center Wharf, where the width is but about 50 feet. Mean range of tides, about 3 feet. The length of the improved channel in the southern arm is about 3,500 feet; along the water front about 1,700 feet; and in the northern arm about 4,300 feet. The head of navigation in this harbor is at the wharves along the water front. The total length of improved channel is 1⅞ miles.

The tonnage and value of the commerce of this harbor, mainly in general merchandise, building material, and fuel, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1904	81,265	$3,751,985	1908 [1]	226,533	$4,984,046
1905	74,546	1,134,748	1909	272,102	8,131,787
1906	88,500	659,864	1910	291,640	9,270,300
1907	107,968	738,706	1911	290,540	9,331,375

[1] Increase mainly due to the receipt of more complete statistics for 1908 than for previous years.

The improvement has resulted in competition which holds freight rates at a reasonable figure.

It is proposed to expend the available funds in dredging for maintenance.

July 1, 1911, balance unexpended	$3,383.14
Received from sales, etc	.85
	3,383.99
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,494.86
July 1, 1912, balance unexpended	1,889.13

CONSOLIDATED.

July 1, 1911, balance unexpended	$10,993.31
Received from sales, etc	.85
	10,994.16
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	4,281.35
July 1, 1912, balance unexpended	6,712.81
July 1, 1912, outstanding liabilities	928.34
July 1, 1912, balance available	5,784.47
Amount appropriated by river and harbor act approved July 25, 1912	11,000.00
Amount available for fiscal year ending June 30, 1913	16,784.47
July 1, 1912, amount covered by uncompleted contracts	3,722.59
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

(See Appendix E 15.)

16. Wappinger Creek, N. Y.—Wappinger Creek is a small stream which empties into the Hudson River from the east about 64 miles by water, north of the Battery, New York City, and about one-half mile below the village of New Hamburg, N. Y. Its source is situated about 30 miles slightly east of north from its junction with the Hudson River. It is obstructed by a series of falls with an aggregate height of 86½ feet above mean low water, at the village of Wappinger Falls, about 2 miles above the mouth of the creek. Below the lower fall, which marks the head of navigation, the creek has a least width of about 90 feet and a greatest width of about 900 feet. Before improvement this section of the creek had a navigable depth not exceeding 6 feet at mean low water through a winding channel, but from 25 to 75 feet wide. An annual freshet raises the level of the water at the head of the creek not exceeding 10 feet.

The mouth of the creek is crossed by a solid fill and trestle bridge provided with a draw span built by the New York Central & Hudson River Railroad, and about 1,000 feet above this bridge a highway crosses the creek over a solid fill having a draw span. The railroad bridge has a horizontal clearance of 40 feet and the highway bridge one of 48 feet.

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[1] Exclusive of amount available for fiscal year 1913.

The section of the creek included in the project for improvement extends from the mouth to about 200 feet below a stone bridge at the lower fall.

The original, which is also the existing, project for improvement is based upon report printed in House Document No. 25, Fifty-first Congress, first session. It was adopted September 19, 1890, and provides for a channel 8 feet deep at mean low water and 80 feet wide, extending from the mouth to about 200 feet below the lower fall. Estimated cost, $13,000. The project was completed, without modification, April 30, 1892, at a cost of $13,000.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to falls	House	[1] 25	Fifty-first	First	1890 [2]	758
Side channel near head of navigation	do	[2] 63	Fifty-ninth	do		
Mouth to falls					1904 [1]	1061

[1] Contains map.

[2] No map.

The work done during the fiscal year resulted in restoring the channel to its projected depth of 8 feet at mean low water from its mouth to the head of the improvement for a least width of 60 feet to 80 feet in the approaches to the railroad bridge, and above this to a least width of 50 feet, except about 100 feet below Brick Yard Dock, where ledge rock uncovered during the dredging reduced the width to about 40 feet. Amount expended during fiscal year, $5,808.59.

Up to June 30, 1912, $25,391.92 had been expended on the project; of this amount $12,391.92 was for maintenance. There was received from sales $0.50.

The project was completed in 1892, since when the channel has been maintained by redredging to such extent as the available funds would permit.

The maximum draft that could be carried June 30, 1912, at mean low water from deep water in the Hudson River to the head of the improvement is about 8 feet for an estimated width of 40 feet, except in the approaches to the railroad bridge, where it is 50 to 70 feet, and about 100 feet below Brick Yard Dock, where it is reduced to about 30 feet by a projecting ledge. It is estimated that the widths of the cuts dredged in 1911 have been reduced to the widths here given by the flowing in of the soft material of the adjacent flats. Mean range of tides at the mouth of the creek is about 3.3 feet. Annual freshets raise the level of the water at the head of navigation not exceeding 10 feet. The head of navigation is at the bridge and lower fall, about 200 feet above the head of the improved channel. Length of improved channel about 2 miles.

The tonnage and value of the commerce of this creek, mainly in cotton goods, building material, and fuel, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1904	56,927	$7,955,975	1908	41,574	[1] $6,990,600
1905	49,532	4,872,903	1909	45,395	7,476,733
1906	46,194	572,399	1910	33,085	1,964,030
1907	44,493	445,765	1911	23,248	2,290,639

The improvement tends to keep railroad freight rates down.

The amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, is to be applied to dredging for maintenance.

July 1, 1911, balance unexpended	$5,917.17
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	5,808.59
July 1, 1912, balance unexpended	108.58
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2] 3,500.00

(See Appendix E 16.)

17. Tarrytown Harbor, N. Y.—This harbor is located on the east shore of Hudson River, about 29 miles, by water, north of the Battery, New York City, where the river is about 3 miles wide. It extends along the shore of the Hudson River for a distance of about 1 mile below Kingsland Point, and before improvement the maximum available depth of water at mean low water over flats extending out from the shore 900 feet to 2,500 feet was about 6 feet, and the general depth over a considerable area of the flats was about 4½ feet. The distance from the shore of the contour of 12 feet depth in the Hudson River varies from about 2,000 feet to about 3,000 feet. A small stream, or rivulet, the Pocantico River, empties into the Hudson River on the harbor side of Kingsland Point. The source of the river is situated about 8 miles northeast of the point.

The original, which is also the existing, project for improvement, is based on report with map printed in House Document No. 283, Fifty-sixth Congress, first session; also, without map, in Annual Report of the Chief of Engineers for 1900, page 1520, and was adopted March 3, 1905. It provides for a channel along the wharf front of the harbor and connecting it north and south with deep water in Hudson River, to be 12 feet deep at mean low water, and 150 feet wide along the wharf front; and 100 feet wide in the northerly and southerly connections with the Hudson River. Estimated cost, $26,000, increased in 1907 to $36,000, and $1,000 or $2,000 biennially for maintenance. This project has not been modified.

The work done during the fiscal year consisted in redredging the channel in the southern arm and in part of the channel extending along the wharf front, and in widening the channel along this front to its projected width of 150 feet; all to a depth of 12 feet below mean low water. Amount expended during the fiscal year was $10,977.44, of which $5,350 was for maintenance.

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[1] Increase due to more accurate returns from interested parties for 1908 than for 1906 and 1907.
[2] Exclusive of the balance unexpended July 1, 1912.

Up to June 30, 1912, $35,570.19 had been expended on this project; of this amount $6,262.78 was for maintenance. There was received from sales $3.25.

About 81 per cent of the work proposed under the project has been completed, resulting in a channel 100 feet wide and 12 feet deep at mean low water in the southern arm; 150 feet wide and 12 feet deep along the wharf front; 60 feet wide and 12 feet deep for 350 feet in length of the eastern end of the northern arm; and 60 feet wide but of less than 12 feet depth for a further distance of 100 feet in the northern arm.

On June 30, 1912, a maximum draft, estimated at 12 feet at mean low water, was available in the southern arm and for a width of 100 feet in the channel along the water front. In the northern arm the maximum available draft was about 5 feet. The length of the improved channel in the southern arm is about 2,500 feet, and along the water front about 1,500 feet. The head of navigation in this harbor is at the wharves along the water front. Mean range of tides is about 3½ feet. The total length of projected channel is about 1⅛ miles.

The tonnage and value of the commerce of this harbor, mainly in general merchandise, coal, and building materials, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1905	71,201	$1,830,092	1908	71,325	$3,648,856
1906	79,714	384,979(?)	1910	60,800	321,900
1907	86,076	3,641,915	1911	207,145	4,520,217

A slight reduction in freight rates has been reported as resulting from the improvement. The channel along the water front having been completed during this fiscal year, the commercial interests of the locality have not had sufficient time in which to take advantage of the benefits to be derived from this improvement. It is understood, however, that extensive wharf improvements are contemplated.

The amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, is to be applied to continuing the improvement and to maintenance by dredging.

July 1, 1911, balance unexpended		$11,409.75
Received from sales, etc		.75
		11,410.50
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$5,627.44	
For maintenance of improvement	5,350.00	
		10,977.44
July 1, 1912, balance unexpended		433.06
Amount (estimated) required to be appropriated for completion of existing project		[1] 6,262.78
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 8,000.00

(See Appendix E 17.)

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[1] Exclusive of the balance unexpended July, 1912.

18. *Removing sunken vessels or craft obstructing or endangering navigation.*—(*a*) *Wreck of canal boat "Calcutta."*—This wreck was reported on July 8, 1911, as endangering navigation in the Hudson River, N. Y., at Middle Ground flats north of Fourmile Point. The owner of the boat could not be found, and the underwriters having abandoned their interests in the wreck, its removal under informal agreement was completed November 22, 1911.

(*b*) *Wreck of landing float* (*no name*).—This float was picked up in midstream in the Hudson (North) River, N. Y., January 5, 1912, and made fast to a pier at West One hundred and fifty-seventh Street, Borough of Manhattan, New York City. It was removed from navigable waters under informal agreement January 10, 1912.

(*c*) *Wreck of canal boat* (*name unknown*).—On March 28, 1912, this wreck was reported as drifting about in the Hudson River, above Poughkeepsie, N. Y., endangering navigation at that place. The wreck was removed under informal agreement April 1, 1912.

(*d*) *Wreck of canal boat "Perty."*—This wreck was reported by letter to the War Department dated May 26, 1911. Investigation showed that the obstruction was probably voluntary, carelessly, or wantonly created. Suit was brought against the supposed owner of the vessel, but upon trial the case resulted in a verdict against the United States.

The wreck was removed by the United States under informal agreement on May 16, 1912.

(*e*) *Wreck of canal boat* (*name unknown*).—This wreck was picked up April 29, 1912, in the East River at Williamsburg Bridge, and made fast to a pier at the navy yard, Brooklyn, N. Y. It was removed under informal agreement May 3, 1912.

(*f*) *Wreck of canal boat "Annie Big."*—On May 13, 1912, this wreck was found floating around between piers at Hoboken, N. J. It was removed under informal agreement May 13, 1912.

(*g*) *Wreck of scow* (*name unknown*).—This wreckage was picked up in the Hudson (North) River, N. Y., on June 22, 1912, and made fast to Pier No. 27, Borough of Manhattan, New York City. To prevent it from again becoming a menace to navigation it was removed under informal agreement June 25, 1912.

(See Appendix E 18.)

EXAMINATION AND SURVEY MADE IN COMPLIANCE WITH THE RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

Reports dated August 7, 1909, and November 17, 1910, with maps, on preliminary examination and survey, respectively, of *Harlem River, N. Y., with a view of straightening the channel at the curve near the Johnson Iron Works*, required by the river and harbor act approved March 3, 1909, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 557, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $850,000, exclusive of the cost of the necessary right of way, subject to certain specified conditions, is presented.

The local officer was also charged with the duty of making other preliminary examinations and surveys, provided for by the river and harbor acts of March 3, 1909, and June 25, 1910, as follows, and reports thereon will be duly submitted when received:

1. *East River, including Little Hell Gate, N. Y.*
2. *Harbor at Port Henry, N. Y.*
3. *Narrows of Lake Champlain, N. Y. and Vt.*

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and surveys required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. *Preliminary examination of Larchmont Harbor, N. Y.*—Report dated April 19, 1911, with map, is printed in House Document No. 418, Sixty-second Congress, second session. The improvement by the United States of this harbor in the manner apparently desired is not deemed advisable at the present time.

2. *Preliminary examination and survey of New York Harbor, N. Y., with a view to determining whether additional channel width and depth are necessary in the North or Hudson River.*—Reports dated May 23, 1911, and March 4, 1912, with maps, are printed in House Document No. 719, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $1,570,000 for first construction is presented.

3. *Preliminary examination and survey of Bronx River, N. Y.*—Reports dated April 26, 1911, and February 5, 1912, with maps; also supplemental report dated March 8, 1912, are printed in House Document No. 897, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $930.000 for first construction, with $3,000 to $4,000 annually for maintenance, subject to certain specified local cooperation, is presented.

The local officer was also charged with the duty of making other preliminary examinations and surveys, provided for by the river and harbor acts approved June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. *Sag Harbor, N. Y.*, with a view to securing increased anchorage area and protecting the channel between said harbor and Gardiners Bay from the erosion of Cedar Point.
2. *Hudson River, N. Y.*, with a view to securing increased depth.
3. *Narrows of Lake Champlain, N. Y. and Vt.*
4. *Hudson River at Ossining, N. Y.*
5. *Milton Harbor and Mill Creek, N. Y.*
6. *Hudson River, N. Y.*, with a view to increasing the width of the channel between the Albany and Greenbush bridge and the New York Central and Hudson River Railroad passenger bridge.
7. *Hudson River, N. Y.*, with a view to securing a suitable depth along the front of Rensselaer between the lower and middle bridges.

IMPROVEMENT OF RIVERS AND HARBORS IN THE SECOND NEW YORK, N. Y., DISTRICT.

This district was in charge of Col. S. W. Roessler, Corps of Engineers. Division engineer, Col. William T. Rossell, Corps of Engineers.

1. *New York Harbor, N. Y.*—There are at present two channels of approach to New York Harbor, the Main Ship-Bayside-Gedney Channel and the new Ambrose Channel.

Main Ship-Bayside-Gedney Channel.—Before improvement by the United States this channel carried a depth of 23.7 feet across the outer bar at mean low water, and about the same depth across three other shoals between the bar and deep water in the harbor. A large proportion of the commerce of the port, carried in vessels of greater draft, could cross these shoals only at or near high water.

The project for the improvement of the outer portion of this channel, known as Gedney Channel, was approved by the Secretary of War, December, 1884, under the provision of the river and harbor act of 1884, and in 1886 was extended to cover the whole of the main entrance. It provided for dredging a channel 30 feet deep at mean low water and 1,000 feet wide between the sea and deep water at the Narrows. The estimated cost was $1,490,000 for dredging 4,300,000 cubic yards. The work was substantially completed in October, 1891, by the dredging of 4,875,079 cubic yards.

The maintenance of this route has been carried on under a project approved November 15, 1892, under the provision of the river and harbor act of July 13, 1892. The total expended in maintenance for the period of 20 years since completion of project in 1892 is $815,898.64. The cost has been increasing from year to year, and the present estimated amount required for maintaining the channel to full width and depth is $100,000 per year. It would not have been below this for several years if the channel had been kept its full width of 1,000 feet. The amount expended in original excavation was $1,518,024.52.

These expenditures have resulted in maintaining a channel 30 feet deep at mean low water for a width of 1,000 feet or over, except on the Main Ship Channel, where the width has varied from 600 to 800 feet.

The near completion of Ambrose Channel renders it much less necessary to maintain these channels to the full projected width and depth. No work upon them has been required for the benefit of navigation during the past year, and none has been done.

The project was further extended by the river and harbor act of June 25, 1910, to include the maintenance of Ambrose Channel under the terms of the river and harbor act which appropriated $200,000 for "improving New York Harbor, N. Y., for maintenance, including Ambrose Channel."

Ambrose Channel.—Ambrose Channel (formerly known as East Channel) had an original available depth of 16 feet at mean low water and was used only by towboats, scows, and very light draft vessels. By the terms of the river and harbor act of 1899 a project was adopted for making an entrance to New York Harbor by this channel, to be 2,000 feet wide and 40 feet deep at mean low water. It involved an estimated excavation of about 42,500,000 cubic yards of material for a length of 7 miles of channel. The work was authorized to be done under a continuing contract, at a cost not exceeding $4,000,000. Under the act of March 3, 1903, two United States dredges were built to supplement the contract work, which was far behind the required rates. In October, 1906, the contractor abandoned the work, and the river and harbor act of 1907 authorized the building of two more United States dredges, at the same time changing the authorized limit of expenditure to $5,148,510. The sundry civil act of June 25, 1910, appropriated $324,510 for this work, which, with prior appropriations, makes up the authorized limit, and which will suffice to complete the construction of the channel.

To June 30, 1912, $5,089,237.68 has been expended in building four dredges and in excavating 61,586,673 cubic yards of sand, mud and stones.

During the fiscal year ending June 30, 1912, two of the United States dredges built for this work were engaged upon it continuously, except when at work upon Coney Island Channel; the other two were leased to other Government channel improvements. The amount of excavation for this channel during the past year was 3,717,742 cubic yards.

Ambrose Channel now has a depth of 40 feet at mean low water with widths from 1,850 to 2,000 feet throughout its entire length, excepting a few shoal spots where soundings show occasional depths between 39 and 40 feet. The channel is easily navigable at mean low tide for ships of 37 feet draft going at moderate speed and has a maximum high-water capacity of 44 feet. The project is regarded as about 96 per cent completed.

This channel was first buoyed for navigation in September, 1907, and regulations were issued by the Secretary of War, under authority of law, restricting its use to daylight navigation by ships of 29 feet draft or over, or of 600 feet length or over. As the improvements progressed it became practicable to remove most of this restriction, and under authority of act of Congress of March 3, 1909, regulations were issued permitting use of the channel by day or night by all steamships or steamers not having tows, regardless of size.

Ambrose Channel is at present safely navigated by steam vessels not only during daylight as formerly but at nights and even in foggy weather. Until within the past three years no vessels attempted to come in at night. At present they come in at all hours of the night and some steamers come in in heavy fog. That such vessels may navigate the channel in safety there should be no other vessels in the course which are not under control.

It would be greatly to the advantage of navigation, if the regulations restricting the use of this channel, issued by the Secretary of War, March 12, 1909, under authority of section 5 of the river and harbor act of 1909 which authorized such regulations "during the further progress of dredging Ambrose Channel," could be made permanent.

It is therefore recommended that the following be enacted:

> That the Secretary of War be and is hereby authorized to make such rules and regulations for the navigation of Ambrose Channel after completion as to him shall seem necessary or expedient to insure its safe use in all kinds of weather night and day, for all vessels under control and running under their own power; and to this end may, in his discretion, forbid its use to tows of every description and to sailing vessels.

Removal of submerged reef in North River, near Pier A, Manhattan.—This reef, with an original depth of 28.8 feet, was wholly removed to 40 feet depth, funds from Ambrose Channel appropriations being applied to the work in accordance with acts of Congress of July 1, 1902, and March 3, 1905. The work was completed in December, 1909, at a total expenditure of $43,979.12, out of which $2,500 was recovered from sureties on a failing contract, making the total net cost to the United States $41,479.12.

Maintenance.—Under the terms of the river and harbor act of June 25, 1910, the maintenance of Main Ship-Bayside-Gedney Channel and of other channels included in the former project, was consolidated with that of Ambrose Channel. After the completion of Ambrose Channel excavation the maintenance of these several channels will be continued in order of necessity and importance. As nearly as can be now estimated, the cost of this work will be $200,000 per annum.

The length of the part of New York Harbor included within the limits of the project (from Atlantic Ocean, to the Battery, New York City) is 22½ miles. The dredging has extended over 15 miles of this route, including Ambrose Channel. The mean rise of tide is 4½ feet.

Anchorage grounds in the upper bay.—These anchorage grounds were laid out about 1898 under authority of an act of Congress, approved May 16, 1888 (25 Stats. L., p. 151), as amended and extended by act approved March 3, 1899 (30 Stats. L., p. 1081). They included shoal-water areas for the use of light-draft vessels and deep-water areas for the accommodation of deep seagoing vessels. The deep-water anchorages were located on the west side of the channel from the southern point of Staten Island to the mouth of the Hudson River in the upper bay. Necessarily they encroached more or less upon the deep-water fairway, but there was still room enough between the outside line of these anchorages and the shoal water on the opposite side for easy navigation up and down the bay by the largest vessels in existence at that time. Since then vessels have been rapidly increasing in size and draft, and complaint has recently been made that the larger vessels now coming to this harbor having a draft of 35 feet or over and requiring a depth of 40 feet for good steering are sometimes crowded to the eastward upon water too shoal for them by the vessels swinging at anchor within the established anchorage grounds.

The complaint has been investigated and found to be well founded; the facts have been presented to the Department of Commerce and Labor, and temporary relief has been obtained by the discontinuance of the anchorage area at the most contracted point abreast of Robbins Reef in the lower portion of the upper bay. This relief, however, has been obtained only at the sacrifice of much-needed anchorage ground, and should be regarded as only a necessary and urgent expedient pending the approval by Congress of a project for improving the upper bay so as to remove all causes for complaint.

Two plans have been considered—one for leaving the anchorage grounds where they are and excavating a deep-water channel 2,000 feet wide and 40 feet deep east of them at a cost of about $740,000; the other for transferring the anchorage grounds to the shoal on the east side of the natural channel, excavating the shoal to the needed depth and providing a main fairway along the route where the present anchorages are located for a full width of 2,000 feet and a depth of 40 feet at a cost of about $473,000. The initial appropriation for this work should be at least $250,000.

The first plan mentioned is favored by the steamship companies, whose views have been asked, as being the one most advantageous for the needs of this great harbor, and is recommended by the district officer, the division engineer, the Board of Engineers for Rivers and Harbors, and by the Chief of Engineers.

Commercial statistics.—The foreign exports and imports for the port of New York during the year ending June 30, 1911, amounted approximately to 13,581,200 short tons, valued at $1,744,877,134, being an increase over the valuation of 1886, before improvement of the harbor entrance was begun, of $904,600,442. The entire cost of this improvement up to this date is about seven-eighths of 1 per cent of the increase in valuation of annual foreign commerce alone for this port since the improvement was begun, and is less than one-half of 1 per cent of the present annual value of foreign commerce.

No detailed statistics of domestic and local commerce are kept.

Recent compilations from reliable sources indicate an approximate annual tonnage for the port of New York of somewhat over 90,000,000 tons.

It is impossible to estimate the effect of the improvement upon freight rates. During 1911, 167 different ships with drafts of 27 feet or more, made 773 trips outward and 248 trips inward. Prior to the improvement none of these ships could have crossed the bar to enter or leave the harbor except at extreme high tide or after lightering.

Further details of the harbor and improvements are printed in the Annual Report of the Chief of Engineers for 1897, page 1031.

A general description of the harbor, of the different channels, of the main entrance, and of the projects for improvement is printed in the Annual Report of the Chief of Engineers for 1901, pages 1285–1287. A map of the harbor is printed in the Annual Report for 1903, page 914.

Reference to examination and survey reports.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Main Ship, Bayside, Gedney Channels (30-foot channels via Sandy Hook). (Maintenance project adopted and approved by Chief of Engineers July 20, 1892.)					1893 [1]	1065
	House	[2] 243	Fifty-fourth	Second	1897 [1]	115
Position of channels located					1903 [2]	914
Ambrose Channel, N. Y., formerly known as East Channel.	House	[2] 243	Fifty-fourth	Second	1897 [1]	115
Published maps of channel, showing progress of work, etc					1903 [2] 1907 [2] 1909 [2]	914 1083 1092

[1] No map.

[2] Contains map.

MAINTENANCE, INCLUDING AMBROSE CHANNEL.

July 1, 1911, balance unexpended	$283, 942. 54
June 30, 1912, amount expended during fiscal year for maintenance of improvement	13, 341. 18

July 1, 1912, balance unexpended	$270,601.36
Amount appropriated by river and harbor act approved July 25, 1912	200,000.00
Amount available for fiscal year ending June 30, 1913	470,601.36
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 200,000.00

AMBROSE CHANNEL.

July 1, 1911, balance unexpended		$224,358.00
Received from other sources		59,798.12
		284,156.12
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$201,581.33	
Treasury settlements	353.44	
		201,934.77
July 1, 1912, balance unexpended		82,221.35
July 1, 1912, outstanding liabilities		25,840.32
July 1, 1912, balance available		56,381.03

(See Appendix F 1.)

2. *Channel in Gowanus Bay, New York Harbor, N. Y.—Bay Ridge and Red Hook Channels.*—These channels lie along the east shore of the upper bay, New York Harbor, and with Buttermilk Channel form an easterly channel between the Narrows and East River, separated from the main channel by a broad shoal off Gowanus Bay and by Governors Island.

Bay Ridge and Red Hook Channels had a natural low-water depth of 7 to 12 feet and were available only for a limited harbor commerce.

The original project, adopted in 1881, provided for making these channels 18 feet deep and 200 feet wide; it was subsequently modified to make the depth 26 feet and width of 800 feet in Bay Ridge Channel and 400 feet in Red Hook Channel. This was completed in 1899 at a cost of about $1,090,000.

The existing project was adopted by the river and harbor act of 1899, which provided for making Bay Ridge and Red Hook Channels 40 feet deep at mean low water and 1,200 feet wide. The work was authorized to be done under a continuing contract at a cost not exceeding $2,500,000. Such a contract was entered into in 1899 for excavating about 22,000,000 cubic yards of material and completing the project. Work was begun in 1900 and prosecuted until November, 1906, generally at rates of progress less than required by the original contract. November 24, 1906, the last of the dredges was withdrawn from the work; the plant had been sold by the contractors, and the new owners refused to continue dredging. The contractors failed to resume work when called upon, and the contract was annulled February 20, 1907.

The river and harbor act of March 2, 1907, authorized the prosecution of the improvement of these channels with a view to obtaining, first, a depth of 35 feet, and subsequently the full depth of 40 feet and width of 1,200 feet, in accordance with the project adopted in 1899; and appropriations of 1907 and 1909 were expended in dredging these channels 35 feet deep for a width of 1,200 feet.

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[1] Exclusive of amount available for fiscal year 1913.

Under the appropriations of June 25, 1910, and March 4, 1911, a contract has been entered into for dredging these channels to 40 feet depth as far as the funds will admit. Work was begun in April, 1911, and is in progress. It is expected that this contract, with funds available, will complete rather more than one-half of Bay Ridge Channel to 40 feet depth.

Under the project of 1899, $2,191,922.42 has been expended in dredging 17,547,218 cubic yards of sand and mud, which is about 80 per cent of the amount of excavation originally estimated as necessary to complete the project. Both channels have been dredged 35 feet deep and 1,200 feet wide, except a small section at the edge of Red Hook Channel; both channels have an available depth of 35 feet for nearly 1,200 feet width, and Bay Ridge Channel has a narrow passage of 40 feet depth.

The total length of channel covered by the improvement is 4¼ miles; the mean rise of tide is 4½ feet.

During the year ending June 30, 1912, 1,027,596 cubic yards of sand and mud were dredged from Bay Ridge Channel, deepening the east half of the channel to 40 feet.

It is proposed to apply present and future appropriations to deepening Bay Ridge and Red Hook Channels to 40 feet, with width of 1,200 feet, as contemplated in the adopted project. In view of the extent and importance of this improvement it is recommended that a further continuing-contract authorization be made for its completion, or at least for the completion of work on Bay Ridge Channel, this latter part of the project being estimated to cost $1,091,000, or $600,000 in excess of funds heretofore appropriated.

After the failure of the original contract for completion of the present project, it was evident that no prices could be obtained which would permit of completing the whole work within the $2,500,000 authorization of 1899. A new survey was made, and in 1909 a new estimate of cost of completion was submitted, which involved an increase in the estimate of $959,000, making the entire cost for the 1899 project $3,459,000.

The commerce of this part of the port of New York consists of coffee, sugar, cotton, coal, and miscellaneous freights, chiefly from foreign ports.

The commerce of these channels during the calendar year 1911 was about 4,502,000 tons, valued at $232,562,000.

Further details concerning these channels are contained in the Annual Report of the Chief of Engineers for 1899, page 1266.

House Document No. 337, Fifty-fourth Congress, second session, contains a report upon a survey of these channels, with map showing locations and depths as existing in 1897. (See Annual Report of the Chief of Engineers for 1897, p. 1177.)

The effect of the improvement projected is undoubtedly to lower freight rates; these rates depend so largely upon the amount of business in hand and upon competition that it is impracticable to separate the effect of the improvement upon rates. A notable effect has been the growth of foreign commerce and the class of ships which carry it, many of which could not have entered Bay Ridge Channel before its improvement. During the past year two European lines have established themselves at the head of Bay Ridge Channel.

Reference to examination and survey reports.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Improving Bay Ridge Channel and Red Hook Channel, New York Harbor.	House	[1] 337	Fifty-fourth	Second	1897 [2]	1177
(Published map shows progress)					1908 [1]	916

July 1, 1911, balance unexpended		$452,903.39
Transfer settlements	$2,163.05	
Received from sale of maps, property, etc	452.67	
		2,615.72
		455,519.11
June 30, 1912, amount expended during fiscal year, for works of improvement		141,277.96
July 1, 1912, balance unexpended		314,241.15
July 1, 1912, outstanding liabilities		34,663.69
July 1, 1912, balance available		279,577.46
July 1, 1912, amount covered by uncompleted contracts		230,542.45
Amount (estimated) required to be appropriated for completion of existing project		[3] 959,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[3] 300,000.00

(See Appendix F 2.)

3. Coney Island Channel, New York Harbor.—This channel lies immediately south of Coney Island, at the southwestern extremity of Long Island, N. Y., and is one of five channels which cross the bar that separates New York lower bay from the ocean. A channel 500 to 560 feet wide and 14 feet deep at mean low water was dredged in 1900, and in 1905 this channel was redredged to a width of 400 feet. When surveyed in 1906, the least depth on the western of two bars in the channel was about 12½ feet at mean low water and about 16 feet on the eastern bar.

The present project for improvement, adopted March 2, 1907, provides for dredging a channel 20 feet deep at mean low water and 600 feet wide, with side slopes of 1 on 3 from deep water in the lower bay to deep water in the Atlantic Ocean at an estimated cost of $168,300, and $20,000 annually for maintenance.

Up to June 30, 1912, $96,511.31 had been expended on this project, all in improvement.

The river and harbor act of March 2, 1907, appropriated $188,300 for this work, being the entire estimated cost for completion of the channel, and for one year's maintenance. A contract for the necessary excavation, about 529,000 cubic yards, was entered into at rate of 27.4 cents per yard. This contract was terminated by a supplemental agreement of August 27, 1908, after 148,211 cubic yards had been excavated, the reason being that the part of the channel dredged in 1907 had wholly filled in by June, 1908. It was therefore proposed to defer further work until some United States seagoing dredge could be assigned to it and the work thus be done at lower rate.

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[1] Contains map. [2] No map. [3] Exclusive of the balance unexpended July 1, 1912.

The cost of annual maintenance of this channel can not be determined until after the original excavation has been completed. It has been roughly estimated at from $20,000 to $50,000.

From July 1, 1911, to April 30, 1912, the dredges from Ambrose Channel worked in Coney Island Channel whenever tide and weather conditions favored, excavating 418,793 cubic yards of sand at a cost of 8.20 cents per yard.

The available funds will be sufficient to complete the channel and probably to maintain it for one year. No appropriation is asked for the year ending June 30, 1914.

The maximum draft which could be carried through this channel June 30, 1912, was 18 feet at mean low water; through the western part, which was naturally 9 to 12 feet deep, and where the dredging has been done, there is an available depth of 20 feet. The mean rise of tide is about 4½ feet. The total length of projected channel is 1⅛ miles.

The project was intended to secure a sufficient channel for the use of tows, principally dump scows entering and leaving New York Harbor, in order to free the main channels from this class of navigation. It is also used, and will be for many years, as the communicating channel between Jamaica Bay and New York Harbor, and is the general route for transporting garbage and refuse to the Barren Island disposal works and for summer excursion boats to and from Coney Island and the Rockaway Beaches.

A report upon the examination and survey of Coney Island Channel and map of the locality are printed in House Document No. 442, Fifty-ninth Congress, second session, and in Annual Report of the Chief of Engineers for 1907, page 145 (without map).

July 1, 1911, balance unexpended	$132,771.53
June 30, 1912, amount expended during fiscal year, for works of improvement	40,945.84
July 1, 1912, balance unexpended	91,825.69

(See Appendix F 3.)

4. Enlargement of Governors Island, New York Harbor, N. Y.—The project for this entire work, adopted under the terms of the sundry civil act of 1901, which made appropriations for beginning operations, included an addition of about 84½ acres to the area of the island by inclosing with a bulkhead part of the shoal southwest of the island and filling the inclosure, the building of a wharf on the north shore and dredging to a depth of 26 feet in front of the wharf, and the erection of buildings. The work of enlargement, including construction of a wharf and dredging, all estimated to cost $1,100,000, was assigned to the Engineer Department. By a modification of the project adopted in April, 1902, the enlargement was to be extended southwest over the shoal to reclaim an additional area of about 19 acres, making the total area of the enlargement about 103½ acres.

On account of economies effected in the cost of the sea wall, no increase in the estimated cost has been found necessary to cover the increased area.

Work was begun in August, 1901, and up to June 30, 1912, $1,098,270.24 has been expended.

During the fiscal year 172,983 cubic yards of material were brought to the embankment, of which 80,538 cubic yards, prism measurement, were placed above low water, adding about 12 acres to the area. Three hundred and fifty-eight linear feet of masonry sea wall were built, completing the inclosure. Seventeen acres of the old fill were graded and 38 acres fertilized and seeded. A light and fog bell were maintained by the Engineer Department at the southwest corner of the sea wall until May 10, 1912, when all the appliances were transferred to the Lighthouse Department.

The entire work done to June 30, 1912, consists in building a pile wharf with a 370-foot T head, dredging the approaches 26 feet deep, laying intercepting sewers, building 7,100 linear feet of masonry wall upon riprap foundation, inclosing about 100 acres, filling the inclosure to height of 10 to 15 feet above low water, and fertilizing and seeding 79 acres of the inclosure.

To provide against further probable settlement of the wall and embankment, it is estimated that about $15,000 may be required within the next three years.

Reference to examination and survey reports.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No	Congress.	Session.	Year.	Page.
Enlargement of Governors Island, New York Harbor (project submitted June 14, 1901):						
Project adopted by sundry civil act of Mar. 3, 1901					1901 [1]	228
Project modified by Secretary of War					1903 [1]	144
Published map shows progress					1903 [2]	922

July 1, 1911, balance unexpended	$77,217.30
June 30, 1912, amount expended during fiscal year, for works of improvement	75,484.94
July 1, 1912, balance unexpended	1,732.36
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[3] 15,000.00

(See Appendix F 4.)

5. Harbors at Port Jefferson, Mattituck, Huntington, Flushing Bay, and Canarsie Bay, N. Y.—(*a*) *Port Jefferson Harbor.*—This is an inland bay about 2 miles long, and of an average width of about three-fourths of a mile, situated on the north shore of Long Island, about 50 miles east of New York City, and connected with Long Island Sound by a narrow entrance.

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[1] No map. [2] Contains map. [3] Exclusive of the balance unexpended July 1, 1912.

Before improvement the channel depth over a bar outside the entrance was but 4 feet at mean low water, whereas the depth in the harbor was 12 feet and more, at low tide, up to within 300 feet of the wharves of Port Jefferson village. Width at entrance channel about 450 feet.

The first project for improvement was adopted in 1871 and completed in 1883 at a total cost of $79,000. Two jetties were built to shelter the inlet channel, one east of the inlet, 1,390 feet long, and one west, 940 feet long, both of scant cross section. A channel 8 feet deep at mean low water and 100 feet wide was dredged through the inlet and shoal outside.

The existing project for improvement, adopted September 19, 1890, and modified August 18, 1894, provides for dredging a channel through the harbor entrance 12 feet deep and 200 feet wide, to be protected by repairing and enlarging the previously built jetties and extending the east jetty to 21 feet depth of water, at mean low water, in the sound. Estimated cost, $145,000.

Up to June 30, 1912, $97,273.10 had been expended on the present project; of this amount $6,046.39 was for maintenance. There were no operations during the year.

About 67 per cent of the work proposed under the present project has been completed and has resulted in making a channel 12 feet deep at mean low water and 200 feet wide and in completing the east jetty to its full projected section for a distance of 1,550 feet, except at the shore end, where it is covered by sand. The west jetty is 940 feet long, with scant cross section. No work has been done on this jetty under the present project. In so far as is known, the dredged channel has maintained its projected depth during the past year.

The maximum draft that could be carried over the shoalest part of the channel June 30, 1912, is probably 11 feet at mean low water. Mean range of tides at entrance, 7 feet; at Port Jefferson wharves, the head of navigation, 6.2 feet. The total length of navigable channel from Long Island Sound is about 2½ miles.

Commercial statistics of Port Jefferson Harbor for various years are given in the following table:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1898	24,940	$360,200	1907	95,455	$1,066,665
1899	42,130	2,145,940	1908	127,230	1,536,000
1903	46,670	776,000	1909	129,365	1,836,550
1904	8,832(?)	90,424(?)	1910	56,935	815,900
1905	19,650(?)	565,700(?)	1911 [1]	------------	------------
1906	118,705	2,544,900			

[1] Statistics were invited, but few replies received; there was, probably, no material difference from report of 1910.

Freight rates have probably been reduced as a result of this improvement.

For detailed reports see Report of the Chief of Engineers for 1895, page 831, and 1900, page 1393. A sketch of Port Jefferson Harbor is printed in Report of the Chief of Engineers for 1900, page 866.

Reference to examination and survey reports.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entrance	None				1889 [1]	751
Do					1908 [2]	866

July 1, 1911, balance unexpended	$4,000.00
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	116.75
July 1, 1912, balance unexpended	3,883.25
Amount appropriated by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	8,883.25
Amount (estimated) required to be appropriated for completion of existing project	[3] 44,773.29

(*b*) *Mattituck Harbor.*—This harbor is a tidal inlet on the north side of Long Island, about 70 miles east of New York City, extending in a southerly direction from Long Island Sound to the village of Mattituck. Originally a milldam and fixed bridge obstructed the creek about 1 mile above its mouth. Before improvement the entrance was obstructed by a shifting sand bar, rising to within from 1 to 2 feet below mean low water plane; thence up to the milldam the depth was from 2 to 7 feet at low tide, and above the latter 6 feet at high tide. The width of the stream was about 150 feet.

The existing project, adopted June 3, 1896, provides for a channel 7 feet deep at mean low water from the entrance to the dam and 7 feet deep at mean high water above the dam to the village, the width to be 80 feet, except near the mouth, where it is increased to 100 feet; the entrance channel to be protected by two jetties. In 1910 Congress made the improvement above the site of the bridge and dam conditional on the substitution of a drawbridge for the fixed bridge and the removal of the dam by the local authorities. Estimated cost to the milldam, $134,200.

In November, 1910, a severe storm from the sound caused a heavy wash of water between the jetties and over the easterly one and resulted in the undermining and destruction of about 18 feet of the fence dike at the south end of the westerly jetty. Similar storms later on destroyed about 42 feet more immediately south of the former break.

Up to June 30, 1912, $82,903.25 had been expended on the project; of this amount $7,116.79 was for maintenance.

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[1] No maps. [2] Contains maps. [3] Exclusive of amount available for fiscal year 1913.

No construction work was done during the year, due to the fact that an easement or right of way for a shore extension of the east jetty could not be procured from the owner of the uplands. Repeated attempts were made by this office and by the local interests, but so far have been unavailing; they are still in progress. The proposed jetty work, it is believed, would tend to reduce the size of a shoal at the entrance, which always forms soon after dredging. Money spent in dredging, without any hope of holding the channel entrance, seems unadvisable.

About 56 per cent of the work proposed under the project has been completed, resulting in building the west jetty to full projected section for a length of 680 feet and the east jetty to full projected section for a length of 775 feet, connecting the west jetty with the shore above high water by a dike 371.1 feet long, and in dredging a channel 7 feet deep at mean low water and 100 feet wide for a distance of about 1,400 feet from the entrance; thence a distance of about 400 feet, the same depth and 80 feet wide; and thence to the milldam the same depth and 60 feet wide. Considerable shoaling has occurred in the entrance channel and about 195 linear feet of the outer end of the west jetty and 95 linear feet of the east jetty have yet to be repaired and made sand tight.

The maximum draft that could be carried June 30, 1912, in the entrance is about 3 feet; thence to the dam 7 feet. Above the milldam the least depth is about 6 feet at mean high water. The head of navigation is at the village of Mattituck. The total length of navigable channel from Long Island Sound to the milldam is about 1 mile; thence to Mattituck about 1½ miles. The mean range of tides outside the entrance is 4.8 feet; below the milldam, which before dredging in the entrance was 2.2 feet, is now 4.4 feet.

The harbor is now used as an anchorage by a number of oyster vessels, and the construction of a wharf, oyster sheds, and a slip for handling cargoes has been commenced.

Based only upon the present amount of commerce using the creek, it would appear doubtful whether the improvement should be extended to the village of Mattituck. By the river and harbor act approved June 25, 1910, the dredging of a channel above the dam to the village was made conditional upon the replacing of the fixed bridge by a suitable drawbridge and removal of the dam by the local authorities. In order to meet this requirement and with a view of securing a channel to the village as originally projected, the local authorities have, under a permit granted by the Secretary of War, completed the construction of a drawbridge, and it is reported that the old dam has been removed. The effect of this work upon the waterway above the bridge will prove detrimental rather than helpful to the village of Mattituck unless a channel be now made to the village as originally projected. This is the only harbor in a length of 48 miles of coast on the north shore of Long Island that can be safely entered by fishing vessels. It lies about midway between Port Jefferson Harbor, on the west, and the Plum Gut entrance to Gardiners Bay on the east.

To make such a channel will require the expenditure of $42,500, in addition to the estimate of $134,200 for completing the project to the milldam, or a total of $176,700 for completing the project to the village. More extended remarks in this connection are contained in the report of the district officer, printed on page 1188 of report for 1910.

A survey of the creek from its mouth to the village of Mattituck was made for the purpose of making an estimate for dredging.

For detailed description of this work see Annual Reports of the Chief of Engineers for 1891, page 843, and 1897, page 1095.

July 1, 1911, balance unexpended	$23,212.57
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,356.37
July 1, 1912, balance unexpended	21,856.20
Amount appropriated by river and harbor act approved July 25, 1912	10,000.00
Amount available for fiscal year ending June 30, 1913	31,856.20
Amount (estimated) required to be appropriated for completion of existing project	[1] 24,350.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 10,000.00

(*c*) *Huntington Harbor.*—This harbor is a landlocked arm of Huntington Bay, about 2 miles long and one-fourth of a mile wide, situated on the north shore of Long Island about 40 miles east of New York City. It extends in a generally southerly direction from Huntington Bay, from which it is separated by a beach of sand and gravel, through the western end of which a narrow inlet connects the harbor and bay.

Before improvement it had a natural available depth of nearly 8 feet, mean low water, for a stretch of 1¼ miles from the entrance southward, thence gradually decreasing to zero toward the head of the harbor. Width at entrance about 150 feet.

In 1872 the first project was adopted, under which, in 1873, a shoal at the harbor entrance was removed and a channel 2,200 feet long, 130 to 150 feet wide, and 8 feet deep at mean low water was dredged up to the town landings at a total cost of $22,500. In 1884 this channel had completely filled up.

The present project, adopted September 19, 1890, provides for dredging and maintaining a channel 8 feet deep at mean low water and 100 feet wide up to the upper wharves, to be protected by piling, if necessary. Estimated cost, $32,000.

Up to June 30, 1912, $40,274.24 had been expended on this project; of this amount $10,785.18 was for maintenance.

During the year 7,500 cubic yards of material were removed from near the head of the harbor. Length of channel redredged, 1,700 linear feet. All for maintenance.

The project is completed, except as to pile construction necessary to maintain the channel. For purposes of maintenance the channel has been dredged 200 feet wide in lieu of pile protection. The dredged channel has deteriorated to a considerable extent in the vicinity of the upper wharves; below this there is a fair channel with minimum depth of about 7 feet and approximate width of 100 feet.

The maximum draft that could be carried June 30, 1912, over the shoalest part of the improved channel is estimated at about 8 feet at mean low water to the upper wharves.

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[1] Exclusive of amount available for fiscal year 1913.

Mean range of tide, 7.2 feet. The head of navigation is at a causeway about one-third of a mile above Town Dock. The total length of navigable channel from Huntington Bay to the causeway is about 2 miles. The length of channel under improvement is about four-fifths of a mile.

Commercial statistics for Huntington Harbor for various years are given in the following table:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1897	23,584	$478,109	1906	105,212	$2,774,850
1899	46,500	605,000	1907	96,196	1,901,061
1900	45,600	768,000	1908	38,316	418,218
1901	52,000	875,800	1909	43,289	476,414
1903	66,000	1,086,000	1911	50,542	548,072
1904	94,950	2,818,250			

This improvement has resulted in a material reduction in freight rates.

For detailed description see Report of the Chief of Engineers for 1897, page 1100. A sketch of the upper part of the harbor is printed in the Annual Report for 1904, page 1023. A sketch of the harbor is shown in House Document No. 827, Sixty-first Congress, second session.

References to examination and survey reports.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Inlet to village wharves	House	[1] 827	Sixty-first	Second		
3500 feet of head of harbor					1898 [1]	976
Do					1904 [1]	1023

July 1, 1911, balance unexpended	$2,501.30
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,273.24
July 1, 1912, balance unexpended	228.06
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2] 5,000.00

(*d*) *Flushing Bay.*—Flushing Bay is on the north shore of Long Island, about 14 miles by water from the Battery, New York City. The bay is about 1 mile wide and 2 miles long, the depth in the original channel, not well defined, being not much greater than elsewhere in the bay. Before improvement the controlling depth up to Flushing was 3.9 feet at mean low water.

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[1] Contains maps.

[2] Exclusive of the balance unexpended July 1, 1912.

The existing project, adopted March 3, 1879, and modified September 19, 1888, and June 9, 1891, provides for building a dike 4,663 feet long on the west side of the channel to protect it from filling and for making and maintaining a channel 6 feet deep at mean low water up to the lower bridge at Flushing. Estimated cost, $173,500.

Up to June 30, 1912, $172,587.74 had been expended on the project. During progress of work it has been repeatedly necessary to redredge some parts of the channel, so that it is not possible to state exactly what part of above sum was used for maintenance. The expenditure to June 30, 1912, for maintenance is estimated at $24,958.79.

During the year 43,891 cubic yards of material were removed from the channel, and resulted in the practical restoration to project dimensions north of the Broadway Bridge.

The project has been completed except as to removing a small shoal below Broadway Bridge and to making such slight changes in the outer end of the dike as to make it less of an obstruction to navigation. A channel has been dredged to a depth of 6 feet at mean low water and 200 feet wide up to Broadway Bridge, except as to the removal of the above-mentioned shoal; thence to Main Street Bridge of the Long Island Railroad Co. 100 feet wide. The whole of the dike is in bad condition, and all of the outer end, 1,606 feet long, with the exception of a few scattering piles and stones, has been carried away by storms and ice. Dike construction was discontinued in 1891. The channel below Main Street Bridge has shoaled to a considerable extent by filling in from the sides.

The maximum draft that could be carried June 30, 1912, from East River to the Broadway Bridge at mean low water is estimated at 6 feet in about mid-channel; thence to the Main Street Bridge about 7 feet. Mean range of tides, 7.1 feet. The head of navigation is about 1 mile above Strong's causeway. The total length of the navigable channel is about 5½ miles, of which about 2½ miles is under improvement.

Commercial statistics of Flushing Bay for various years are given in the following table:

Year.	Short tons.	Value	Year.	Short tons.	Value.
1897	163,395	$1,449,438	1906	273,312	$3,987,444
1899	158,755	1,584,937	1907	232,911	2,587,825
1901	200.473	4,196,406	1908	126,455	1,774,900
1902	186,000	1,618,100	1909	277,800	879,700
1903	110,100	960,750	1910	563,029	1,256,880
1904	142,996	2,599,488	1911	394,828	3,251,548
1905	142,274	2,656,650			

This work has facilitated transportation, but no appreciable effect on freight rates has been ascertained.

For detailed report see Reports of the Chief of Engineers for 1897, page 1106, and 1905, page 990. A map is printed in the Report of the Chief of Engineers for 1903, page 868.

Report upon an examination and survey of Flushing Bay, made in 1903-4, and map of the locality, are printed in House Document No. 98, Fifty-eighth Congress, third session.

A report upon an examination of Flushing Bay and Creek made March 23, 1910, and a map of the locality are contained in House Document No. 1333, Sixty-first Congress, third session.

References to examination and survey reports.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
East River to upper railroad bridge	House	[1] 98	Fifty-eighth	Third		
East River to head of navigation	do	[1] 1333	Sixty-first	do		
Through Flushing Bay					1878 [2]	430
Do					1879 [2]	885
East River to Broadway Bridge					1885 [1]	666
Do					1889 [1]	782
Do					1908 [1]	868

July 1, 1911, balance unexpended	$18, 377. 72
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	11, 059. 71
July 1, 1912, balance unexpended	2, 318. 01
Amount appropriated by river and harbor act approved July 25, 1912	4, 000. 00
Amount available for fiscal year ending June 30, 1913	6, 318. 01
Amount (estimated) required to be appropriated for completion of existing project	[3] 12, 251. 64
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	20, 000. 00

(*e*) *Canarsie Bay.*—This bay forms the northwest part of Jamaica Bay, Long Island, at Canarsie Landing. The original depth from the landing to Big Channel was 4.2 feet and to Island Channel 1.3 feet at mean low water. Width in former about 75 to 100 feet.

The existing project, adopted June 14, 1880, and enlarged in 1889 and 1896, provides for the construction of two dikes and dredging between them where necessary to secure a channel 100 to 150 feet wide and 6 feet deep at mean low water connecting the steamboat dock at Canarsie with Big Channel, Jamaica Bay; also for a channel 4 feet deep and about 50 feet wide, running in a southwesterly direction from Canarsie Landing to Island Channel, and for a channel 5 feet deep and 50 wide, running in a northeasterly direction to Gophel Channel. Estimated cost, $88,000.

Up to June 30, 1912, $72,833.81 had been expended on the project; of this amount $2,961.45 was for maintenance.

There were no operations during the year.

The work of improvement under the project has been completed. The main channel has deteriorated to an appreciable extent and the dikes are in very poor condition. Improvements by local interests have resulted in the deepening of the projected channels along the wharves and landings.

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[1] Contains maps. [2] No maps. [3] Exclusive of amount available for fiscal year 1913.

The maximum draft that could be carried June 30, 1912, over the shoalest part of the channel at mean low water is estimated at 6 feet in the main channel in about mid-channel, 2½ feet in the West Branch, and 3 feet in the East Branch. Mean range of tides, 4.7 feet. The total length of the improved main channel is about 1 mile and of the branch channels about five-eighths of a mile. The head of navigation is at Canarsie Landing.

Commercial statistics of Canarsie Bay for various years are given in the following table:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1898	50,000	$427,375	1908	240,075	$1,125,290
1901	450,000	2,000,000	1909	695,320	2,116,670
1904	124,594	1,861,008	1910	44,800	416,000
1905	95,460	1,714,022	1911 [1]		
1907	127,515	413,784			

[1] Consolidated with commercial statistics for Jamaica Bay.

The commerce in Jamaica Bay has been greatly benefited by this improvement. Transportation has been developed, but no reduction of freight rates has been ascertained.

This locality falls within the limits of the greater improvement of Jamaica Bay. The city of New York having now taken definite action toward carrying out this improvement, it is not believed the United States should expend any additional funds on the Canarsie project. It will, therefore, be dropped from future reports.

Details as to this improvement may be found in Report of the Chief of Engineers for 1897, page 1114. A sketch of Canarsie Bay is printed in Report of the Chief of Engineers for 1904, page 1026.

Section covered.	Congressional documents.				Annual reports Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Big Channel to Canarsie Landing					1882 [1]	670
Do					1904 [1]	1026

[1] Contains maps.

July 1, 1911, balance unexpended	$2,916.19
July 1, 1912, balance unexpended	2,916.19

CONSOLIDATED.

July 1, 1911, balance unexpended	46,007.78
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	14,806.07
July 1, 1912, balance unexpended	31,201.71
Amount appropriated by river and harbor act approved July 25, 1912	19,000.00
Amount available for fiscal year ending June 30, 1913	50,201 71

Amount (estimated) required to be appropriated for completion of existing project	[1] $81, 374. 93
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 35, 000. 00

(See Appendix F 5.)

6. Hempstead Harbor, N. Y.—This harbor is situated on the north shore of Long Island, about 29 miles, by water, east of the Battery. New York City. It is divided by a narrow neck of land into an outer and inner harbor. The proposed improvement includes only the latter, which is approximately 2 miles long and one-third of a mile wide, except at its extreme southern end. Originally a channel not less than 6 feet deep at mean low water, with varying widths, extended from the outer harbor to about opposite Ward's wharf; thence to the head of the harbor the depth gradually diminished to zero at Roslyn wharf, with no well-defined width, above which the bottom of the harbor was exposed at low water.

The existing project, adopted by the river and harbor act of June 25, 1910, provides for a channel 6 feet deep at mean low water and 100 feet wide from the entrance to the head of the natural deep basin about opposite Ward's wharf; thence 80 feet wide to the town wharf at Roslyn; and thence to the head of navigation 50 to 70 feet wide, in accordance with plan printed in Rivers and Harbors Committee Document No. 1, Sixty-first Congress, second session, at an estimated cost of $47,000, and $3,000 annually for maintenance. Being a new channel, the estimate for maintenance will probably have to be increased for the first year owing to the excessive refill from the adjacent mud flats.

The river and harbor acts of June 25, 1910, and February 27, 1911, made appropriations of $47,000 for completing the improvement and provided that no part of this sum should be expended upon the channel above the town wharf until a suitable dumping ground for the material dredged had been furnished by the local interests, free of cost to the United States.

The amount expended to June 30, 1912, was $21,868.94.

During the year 87,187 cubic yards of material were removed from the channel, extending it to a point 500 feet south of the Roslyn town wharf. Of this amount 70,039 cubic yards were removed under a former contract and 17,148 cubic yards under the existing contract. Total length of channel made during the year, 2,400 feet; partially completed, 500 feet. The project is about 63 per cent completed.

For further references see Annual Report of the Chief of Engineers for 1910, pages 155 and 1193; also River and Harbor Committee Document No. 1, Sixty-first Congress, second session.

The maximum draft that could be carried from the entrance to about 500 feet south of Ward's wharf is about 6 feet; thence the depth gradually diminishes to the head of the harbor, where the bottom is exposed at low water. Mean range of tides, 7.7 feet. The length of navigable channel from the entrance is about 2 miles. The head of navigation is at a dam at Hicks's lumber yard in Roslyn.

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[1] Exclusive of amount available for fiscal year 1913.

Commercial statistics for Hempstead Harbor for various years are given in the following table:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1909	1,840,219	$1,610,739.95	1910	1,918,889	$1,675,173.34
			1911	844,480	614,833.50

July 1, 1911, balance unexpended	$46,562.52
June 30, 1912, amount expended during fiscal year, for works of improvement	21,427.94
July 1, 1912, balance unexpended	25,134.58
July 1, 1912, outstanding liabilities	1,952.15
July 1, 1912, balance available	23,182.43
July 1, 1912, amount covered by uncompleted contracts	9,159.75
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

(See Appendix F 6.)

7. *Newtown Creek, N. Y.*—This creek, an inlet of the East River, extending inland between the Boroughs of Brooklyn and Queens, in New York City, for a distance of about 4 miles, had a natural depth varying from 12½ feet at the mouth to 4 feet at the head of navigation.

The original project, adopted in 1880 and modified in 1884, provided for a channel 240 feet wide and 21 feet deep from the mouth to the Vernon Avenue Bridge; thence to the head of navigation on both branches or channels, decreasing from 175 to 100 feet in width and from 18 to 10 feet in depth. The cost of the work was estimated at $255,500. In carrying out this project $197,500 was expended.

The existing project, adopted June 3, 1896, provided for a uniform channel 125 feet wide and 18 feet deep from the East River to the head of navigation in the creek and in English Kills, respectively, at the Metropolitan Avenue Bridge, at an estimated cost of $450,000. This estimate was subsequently reduced to $213,000. The channel having been reported completed with the exception of some widening at the entrance, $15,000 was appropriated by act of Congress approved March 4, 1907, for continuing the improvement. This increased the estimate for completion to $228,000.

Up to June 30, 1912, $243,031.33 had been expended on the project. Of this amount $39,267.52 was for maintenance. Received during the year from sales of maps, $2.75.

During the year 5,666 cubic yards of material were removed from the channel in the vicinity of the Meeker Avenue Bridge, and resulted in the restoration of about 550 feet to projected depth, and a width of 90 feet under a contract now in operation.

About 90 per cent of the work proposed under the present project has been completed, resulting in making a channel of the projected width and depth, with the exception of some widening at the entrance. The channel requires extensive redredging.

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[1] Exclusive of the balance unexpended July 1, 1912.

The maximum draft that could be carried over the shoalest part of the channel June 30, 1912, at mean low water was about 14 feet. The mean range of tides is about 4½ feet. The total length of navigable channels is about 4 miles. The head of navigation in the creek is at Metropolitan Avenue Bridge, about 3 miles from the entrance, and in English Kills at Metropolitan Avenue Bridge, about 3½ miles from the entrance. The length of channel under improvement is about 3 miles in the creek and about one-half mile in the kills.

Commercial statistics for Newtown Creek for various years are given in the following table:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1903	2,675,025	$90,535,640	1908	4,181,628	$229,994,000
1904	3,771,726	108,313,377	1909	5,118,628	258,003,661
1905	3,428,404	130,812,974	1910	3,861,852	129,378,682
1906	2,803,380	214,714,751	1911	5,485,016	191,747,615
1907	3,108,374	175,229,846			

The increased depth resulting from this improvement has greatly benefited commerce.

Freight rates have been reported as greatly reduced by this improvement. It is difficult if not impracticable to ascertain details; but the large and valuable commerce of this water is the best index to the effect of the improvement.

It is proposed to apply the amount estimated for the fiscal year ending June 30, 1914, to maintenance.

Detailed descriptions of this improvement are printed in the reports of the Chief of Engineers for 1896, page 759, and 1900, page 1411. A sketch of the locality is printed in Report of the Chief of Engineers for 1904, page 1034.

References to examination and survey reports.

Section covered.	Congressional documents.				Annual reports Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to head navigation	House	[1] 323	Fifty-fourth	First	1896 [1]	763
West branch	do	[1] 32	Fifty-third	Third	1895 [1]	[2] 1006
Mouth to head navigation					1904 [3]	1034

[1] No maps. [2] Preliminary examination. [3] Contains maps.

July 1, 1911, balance unexpended	$26,566.32
Received from sale of maps	2.75
	26,569.07
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	881.92
July 1, 1912, balance unexpended	25,687.15
July 1, 1912, outstanding liabilities	1,040.44
July 1, 1912, balance available	24,646.71

Amount appropriated by river and harbor act approved July 25, 1912	$15,000.00
Amount available for fiscal year ending June 30, 1913	39,646.71
July 1, 1912, amount covered by uncompleted contracts	22,959.56
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 30,000.00

(See Appendix F 7.)

8. Wallabout Channel, N. Y.—This channel consists of a waterway extending in a half circle around the inside of the island known as Cob Dock, which lies in Wallabout Bay, a slight indentation of the East River, off the United States navy yard at Brooklyn, N. Y., and is part of the United States property. Wallabout Channel connects with the East River east and west of Cob Dock.

The channel is separated into two parts, called the "east" and "west" channels, by a stone causeway which connects the mainland with Cob Dock. The east channel, which is about 2,000 feet long and from 250 to 350 feet wide, and had available depths of from 16 to 20 feet along the line of deepest water, diminishing to 5 feet along the sides, is the part embraced in the approved project for improvement.

The existing project, adopted in 1899, is to secure a depth of 20 feet at mean low water and widths ranging from 230 to 350 feet from the entrance at East River to the causeway.

The channel was secured in accordance with the project in 1900, at a cost of $18,173.69.

Up to June 30, 1912, $35,963.57 had been expended on the project. Of this amount $17,789.88 was for the purpose of maintenance.

There were no operations during the year.

The maximum draft at mean low water that could be carried over the shoalest part of the channel June 30, 1912, is about 20 feet in mid-channel, reducing to less than 14 feet on the slopes. Mean range of tides, 4 feet. Total length of improved navigable channel is about one-half mile. The head of navigation in the channel is at the causeway. At the head of the channel are two bodies of navigable water, Kent Avenue Basin and Wallabout Basin, about 2,200 feet long and about 1,300 feet long, respectively. Both are situated inside of established harbor lines, but are extensively used by the commerce of this section of Brooklyn Borough, New York City.

Commercial statistics for Wallabout Channel for various years are given in the following table:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1907	840,300	$16,008,000	1910	1,095,580	$8,726,300
1908	987,884	4,444,600	1911	1,136,444	9,885,788
1909	1,094,829	3,545,675			

The available funds, or so much thereof as may be required, will be applied to the restoration of the channel.

A detailed description of this improvement is printed in the Report of the Chief of Engineers for 1899, page 1242. A sketch of the locality is printed in House Document No. 50, Fifty-fifth Congress, third session.

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[1] Exclusive of amount available for fiscal year 1913.

References to examination and survey reports.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
East Channel	House	[1] 122	Fifty-fourth	Second		
Do	do	[2] 50	Fifty-fifth	Third		
Do					1899[1] [3]	1251

[1] No maps. [2] Contains maps. [3] Survey report.

July 1, 1911, balance unexpended	$4,036.93
July 1, 1912, balance unexpended	4,036.93

(See Appendix F 8.)

9. Browns Creek, N. Y.—This is a narrow stream which empties into Great South Bay, Long Island, near Browns Point. It had originally widths varying from 20 to 150 feet and depth of from 1 to 3 feet at low water, a bar at the mouth having less than 1 foot.

The project for improvement, adopted September 19, 1890, provides for a channel from the 6-foot contour in the bay to Sayville highway bridge, to be 100 feet wide and 4 feet deep at mean low water, with 2 feet greater depth at the entrance for a length of 1,500 feet, and to be protected at the entrance by jetties on both sides, the west jetty to be 1,600 feet long and the east jetty 1,400 feet long. Estimated cost, $46,000.

Up to June 30, 1912, $38,734.02 had been expended on the project, of which amount $13,734.02 was for maintenance.

During the year 15,000 cubic yards of material were pumped from the channel and deposited on the adjacent marshes. This work resulted in the restoration of about 1,500 feet of channel to projected depth and width inland from the outer ends of the jetties.

Surveys before and after dredging were made in connection with dredging operations.

After 54 per cent of the work proposed under the project had been completed, resulting in the building of two jetties at the entrance and in the dredging of a channel 100 feet wide and 4 feet deep at mean low water for a distance of 3,200 feet from the entrance, this dredged channel was redredged in 1905 to 4 feet depth at mean low water for a distance of about 1,200 feet from the end of the jetties.

The west jetty has been built to a length of 492 feet and the east jetty to a length of 438 feet, both with top width of 3 feet at 1 foot above high water, and both partly covered at the shore end by accretion. Both jetties have deteriorated to such extent that they offer but slight protection to the channel at the entrance.

The maximum draft that could be carried over the shoalest part of the dredged channel at mean low water June 30, 1912, is about 2½ feet; mean range of tides, 1 foot. The head of navigation is at the Sayville highway bridge, about 1¼ miles from the mouth.

Because of rapid deterioration, due mainly to the inflow of mud from the marshes bounding the channel, $13,734.02 has already been expended in redredging; the jetties, built only to about one-third of their projected lengths, offer but slight protection to the entrance.

The total cost of completing the project will be much greater than the original estimate, and if the channel, which is now only 3,200 feet long and requires redredging, is extended upstream, the expenditure for maintenance will increase proportionately.

Considering the limited number of vessels using this creek for transportation purposes, the cost of improving and maintaining the entire length to Sayville, and completing the jetties as projected, would be out of proportion to the benefits to be derived therefrom.

Commercial statistics for Browns Creek for various years are given in the following table:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1898	10,700	$213,800	1906	29,675	$963,880
1899	11,642	251,350	1907	34,975	1,043,865
1901	17,025	454,500	1908	25,240	924,780
1902	17,630	299,300	1909	36,605	1,006,550
1903	20,380	609,450	1910	32,945	906,100
1904	24,000	807,075	1911 [1]	7,950	58,850
1905	51,675	1,811,195			

This improvement has resulted in providing a harbor for fishing boats, but probably has had no effect on freight rates.

Details in reference to this work appear in Reports of the Chief of Engineers for 1897, page 1111, and for 1900, page 1417. A sketch of the creek is printed in Report of the Chief of Engineers for 1894, page 710.

References to examination and survey reports.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to Highway Bridge	House	[2] 22	Fifty-first	First		
Do					1894 [3]	710

July 1, 1911, balance unexpended	$6,927.87
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	6,660.51
July 1, 1912, balance unexpended	267.36
Amount (estimated) required to be appropriated for completion of existing project	[4] 13,673.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[4] 10,000.00

(See Appendix F 9.)

10. Great South Bay, N. Y.—The first project, adopted September 19, 1890, provided for the improvement of the Patchogue River, a small inlet extending from Great South Bay, Long Island, to the village of Patchogue. This stream had, before improvement, a width of about 200 to 400 feet and a depth of 2 feet. The project provided for a channel about 5,000 feet long, 60 feet wide, and 6 feet deep, to be protected at its mouth against westerly storms by a jetty 1,700 feet long. Estimated cost, $40,000. On June 30, 1902, there had been expended on this work $40,000, and the project was completed.

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[1] Reduction attributed to bad condition of channel.
[2] No maps.
[3] Contains maps.
[4] Exclusive of the balance unexpended July 1, 1912.

The present project, adopted June 13, 1902, provides for dredging a channel from Fire Island Inlet, which connects Great South Bay with the ocean, to Patchogue, on Patchogue River. From the inlet to the central basin in Great South Bay the channel is to be 10 feet deep at mean low water and 200 feet wide. From the central basin to Patchogue the channel is to be 8 feet deep and 100 feet wide at mean low water. The river and harbor act approved June 25, 1910, provided for redredging the channel and the construction of jetties, but omitting the dredging from the inlet to the central basin, increasing the estimate for completion from $66,000 to $141,000, and $2,000 annually for maintenance.

Up to June 30, 1912, $97,829.87 had been expended on the project, of which amount $38,009.05 was for maintenance. There was received during the year, from the sale of maps, $1.45.

During the year 68,097 cubic yards of material were pumped from the channel and deposited on adjacent uplands, and in a small cove on the west side of the stream. This work resulted in the restoration of about 5,500 linear feet of channel to projected width and depth, from a point 550 feet outside the stone breakwater to the head of navigation.

Surveys before and after dredging were made in connection with dredging operations.

About 41 per cent of the work contemplated under the present project has been completed, resulting in a channel 200 feet wide and 10 feet deep at mean low water in the bay, except at bars A and B, and in dredging a channel 100 feet wide and 8 feet deep at mean low water in the river. Considerable shoaling in the latter always occurs after dredging has been done. To maintain the channel at a minimum of cost the present west jetty may have to be extended to at least the 7-foot contour in the bay, and an easterly jetty built out from the shore to the same contour; this matter is now under consideration. Dredging through the bars in the bay is not contemplated for the present.

The maximum draft that could be carried June 30, 1912, over the shoalest part of the channel from Fire Island Inlet to Central Basin is estimated at 8.5 feet, and in Patchogue River at not more than 8 feet.

Mean range of tides, 1 foot. The head of navigation in Patchogue River is at a fixed bridge at Division Street, Patchogue. The total length of navigable channel from Fire Island Inlet to Patchogue is about 17½ miles and to Belleport 22 miles. The length of channel under improvement at Patchogue is about seven-eighths of a mile.

Commercial statistics for Great South Bay for various years are given in the following table:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1898	255,200	$3,702,000	1905	224,526	$3,871,850
1899	266,800	3,808,500	1906	232,500	4,014,000
1900	274,100	3,919,000	1907	224,103	3,908,723
1901	281,300	4,025,000	1908	195,000	3,820,000
1902	257,500	4,000,000	1909	204,500	3,406,000
1903	258,500	3,995,000	1910	181,000	3,220,600
1904	257,879	4,087,130	1911	180,800	3,135,000

As a result of this work navigation has been aided and commerce correspondingly benefited. So far as can be ascertained no reduction in freight rates has resulted, due, no doubt, to the dangerous condition of Fire Island Inlet.

For details as to improvement see Patchogue River, Reports of the Chief of Engineers for 1897, page 1108, and for 1901, page 1249. A sketch is printed in Report of the Chief of Engineers for 1903, page 876.

References to examination and survey reports.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Fire Island to head of Patchogue River.	House	[1] 133	Fifty-sixth	First	1900 [1]	1443
Patchogue River	do	[1] 171	do	do		
Fire Island Inlet to head of Patchogue River.	do	[1] 103	do	Second	1901 [1]	1249
Patchogue River					1893 [2]	984
Point o' Woods to head of Patchogue River.					1903 [2]	876

July 1, 1911, balance unexpended		$55,319.88
Received from sale of maps		1.45
		55,321.33
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$27,143.83	
For maintenance of improvement	3,000.00	
		30,143.83
July 1, 1912, balance unexpended		25,177.50
Amount (estimated) required to be appropriated for completion of existing project		[3] 25,305.45
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[3] 5,000.00

(See Appendix F 10.)

11. Jamaica Bay, N. Y.—This bay lies wholly within the limits of New York City in the south shore of Long Island, N. Y. It is approximately 8 miles long and 4 miles wide, and covers an area of about 32 square miles. It is connected with the ocean at Rockaway Inlet by a shifting channel having a least depth over the bar of about 13 feet at mean low water when surveyed in 1908, increasing to about

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[1] No maps. [2] Contains maps. [3] Exclusive of the balance unexpended July 1, 1912.

50 feet inside of Rockaway Point. Low lying hummocks in the bay and bounding marshes reduce the water area to about 25 square miles. Numerous channels, varying both in width and depth, pass between the hummocks and along the shores of the bay, some of which are not navigable at ordinary low water.

In the river and harbor act approved June 25, 1910, Congress adopted a project for improvement in accordance with the report submitted in House Document No. 1488, Sixtieth Congress, second session, and appropriated $250,500 for the work, with the proviso that no part of this amount shall be expended until the Secretary of War is satisfied that the city of New York is prepared to undertake its part of the general plan for the improvement of Jamaica Bay as outlined in the report cited above.

In this project the United States and the city of New York propose to enter into a general plan of improvement of Jamaica Bay, the dredging and maintenance of an entrance channel to be undertaken by the United States; dredging of the interior channel by the city of New York, to be reimbursed to a specified amount by the United States; and bulkheading the shores of the bay and filling behind bulkheads by the city of New York.

It is proposed that the General Government provide the main waterway and the city the auxiliary waterways, bulkheads, fills, and basins. The main waterway as defined above is of two parts—(*a*) an entrance channel between the deep water of the ocean and the southeast corner of Barren Island and (*b*) a main (interior) channel lying at the inner end of the entrance channel and terminating at the mouth of Cornells Creek. Under this arrangement the United States is to open and maintain the channel of entrance, and the city of New York is to dredge the main interior channel and "be reimbursed therefor at the rate of 8 cents per cubic yard, place measurement, for all material dredged within the limits of the main channel to the extent only of $4,720,000 less cost to the Government of superintendence, surveying, and inspecting."

The main waterway, as projected, is to have ultimately a depth of 30 feet with a width of 1,500 feet in the entrance channel, and a width of 1,000 feet in the main channel. The channels are to be opened and maintained by dredging, and by the construction of jetties at the entrance to the bay, if necessary. The total ultimate cost to the United States for the improvement should not exceed $7,430,050, plus the cost of maintaining the entrance channel.

It is proposed first to open and maintain an entrance channel 18 feet deep and 500 feet wide at an estimated cost of $250,500. It is proposed further that "the city shall not be reimbursed for excavating any material from the main channel below the depth of 18 feet until the United States has undertaken to increase the depth of the entrance channel beyond 18 feet."

In the river and harbor act of 1910 Congress appropriated the amount estimated for opening the 18-foot entrance channel, $250,500, with provision that it should not be expended until the city of New York should take certain definite action to the satisfaction of the Secretary of War. To meet this condition the city of New York has appropriated $1,000,000 toward its part of the proposed work, to be applied by the Department of Docks and Ferries as follows: For construction of a bulkhead or wall, $50,000; for dredging in the main channel of Jamaica Bay, contingent upon provision for reimbursement by the United States for all or part of the cost of said dredging, $150,000; for acquiring lands needed for filling purposes, $750,000, the application of the other $50,000 being otherwise provided for. This action has been accepted by the Secretary of War as satisfactory, and arrangements have been made to begin excavation of the entrance channel with the New York Harbor dredges.

The river and harbor act approved July 25, 1912, made an appropriation of $300,000 for beginning excavation of the channels within the bay, specifying that—

> from which amount the Secretary of War may reimburse the city of New York each month for the dredging and the disposition of dredged material of the preceding month at the actual unit price per cubic yard, place measurement: *Provided*, That such cost does not exceed eight cents per cubic yard.

An examination of the bar and channel at the entrance, made in the winter of 1911–12, showed that the westward progress of Rockaway Point and of the channel had continued since the survey of 1908 to a total amount of 700 feet. Actual dredging had been deferred for a new lay-out of the channel based on the new examination and for removal of trans-Atlantic cables which cross the channel. Dredging is to begin at once.

The maximum draft that could be carried through the inlet on June 30, 1912, at mean low water is estimated at 13 feet, reducing to less than 1 foot at the head of the bay. The mean range of tides varies in different localities from 4.8 feet to 5.1 feet. The head of navigation in the bay is at Nortons Point, about 11 miles from the entrance at Rockaway Inlet; a number of narrow tidal creeks enter the bay from the east and north.

Disbursements during the past fiscal year, $2,090.64, were in part payment of office expenses; the total expenditure to June 30, 1912, is $2,606.81.

Commercial statistics for Jamaica Bay for the last three years are reported as follows:

Year.	Short tons.	Value.
1909	977,266	$3,846,574
1910	1,785,605	4,681,348
1911	957,271	1,928,118

The amount required for the fiscal year ending June 30, 1914, depends largely upon progress made by the city of New York upon the interior improvement; it is estimated that this may be about $300,000. No additional funds will be required for the entrance channel during that year.

Detailed description of this improvement and map of the bay are printed in House Documents Nos. 1488 and 1506, Sixtieth Congress, second session.

July 1, 1911, balance unexpended	$249,994.68
Received from sale of maps	28.26
	250,022.94
June 30, 1912, amount expended during fiscal year, for works of improvement	2,090.64
July 1, 1912, balance unexpended	247,932.30
Amount appropriated by river and harbor act approved July 25, 1912	300,000.00
Amount available for fiscal year ending June 30, 1913	547,932.30
Amount (estimated) required to be appropriated for completion of existing project	[1] 6,879,550.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 300,000.00

(See Appendix F 11.)

12. Sheepshead Bay, N. Y.—Sheepshead Bay, a tidal arm of the sea separating the eastern end of Coney Island from the mainland of Long Island, is situated entirely within the city limits of Greater New York, 15 miles by water from the Battery. The entrance is obstructed by a sand bar, over which there is approximately only 3 feet of water at low tide. Within the bay there is a good channel, with depths sufficient to meet the present needs of navigation. The proposed improvement is of a temporary nature and contemplates only a channel through the bar at the entrance.

The project adopted by the river and harbor act of July 25, 1912, provides for a channel 6 feet deep at mean low water and 100 feet wide, from the 6-foot contour in the ocean to the corresponding contour in the bay, crossing the bar about 500 feet east of the existing bulkhead of the Manhattan Beach Estates, and, swinging to the westward, entering the bay near its north side. Length, about 2,200 feet. Estimated cost, $13,600. No estimate for maintenance.

This channel crosses lands under water owned by the Manhattan Beach Estates and falls partially within harbor lines approved by the Secretary of War May 1, 1911. The Manhattan Beach Estates expect to reclaim in due time all of its submerged possessions in that vicinity under permit which has been issued by the War Department, which permit provides for the construction of a new exit for Sheepshead Bay farther to the eastward before the present channel shall be filled in. The work now in view under the present appropriation is to improve the present channel to a sufficient width and depth to meet the needs of commerce until the new and better channel to be provided in the process of reclamation is ready for use.

The maximum draft that can be carried over the bar is estimated at about 3 feet at low tide. Mean range of tide, 4.8 feet.

There were no operations or expenditures during the year.

Commercial statistics for Sheepshead Bay are given in the following table:

Year.	Short tons.	Value.
1911	28,700	$76,500

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[1] Exclusive of amount available for fiscal year 1913.

For detailed report, see House Document No. 959, Sixty-first Congress, second session. Map not published.

Amount appropriated by river and harbor act approved July 25, 1912	$13,600
Amount available for fiscal year ending June 30, 1913	13,600

(See Appendix F 12.)

13. Removing sunken vessels or craft obstructing or endangering navigation.—(*a*) *Wreck of canal boat "Martha A. Bigelow."*—This canal boat, abandoned and sunk to the water's edge, was found July 20, 1911, drifting about New York Harbor in vicinity of the Narrows, where tide carried her against the dock of the Crescent Athletic Club, grounding her. The wreck was removed August 4, 1911.

(*b*) *Wreck of schooner "Garfield White."*—On July 5, 1910, this schooner, coal laden, sank about 8 miles east of Ambrose Channel Light Ship; was promptly buoyed, but finally abandoned. It was thought the wreck would shortly break in pieces, in which case, owing to the depth of water, it would not be a serious obstruction to navigation. It was, however, necessary to remove her. This was accomplished October 26, 1911.

(*c*) *Wreck of old mud scow* (*no name or number*).—This scow floated up Mattituck Creek, N. Y., and sank about 200 feet below the Old Mill in August, 1911, in such a position as to interfere with navigation. The obstruction was removed June 22, 1912.

(*d*) *Wreck of abandoned canal boat.*—This canal boat, abandoned and adrift in the channel of the Upper Bay near St. George, S. I., New York, was taken in charge and tied up to pier of lighthouse station, Tompkinsville, N. Y., where she sank. It obstructed the use of that pier and adjoining slip and was removed about February 10, 1912. The name of the boat had been completely obliterated and could not be discerned.

(*e*) *Wreck of old scow* (*no name or number*).—This scow sank in Newtown Creek, at foot of Maspeth Avenue, in May, 1912. Its position was such as to form a menace and obstruction to navigation. It was advertised for removal June 11, 1912, bids to be opened June 21, 1912. Lowest bid received, $521, was that of the Baxter Wrecking Co. The wreck had not been removed at the close of the fiscal year.

The amount of money expended during the fiscal year in this district for removal of wrecks was $1,904.91.

EXAMINATIONS AND SURVEYS REQUIRED BY RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. Preliminary examination of Mount Sinai Harbor, N. Y.—Report dated August 18, 1911, is printed in House Document No. 426, Sixty-second Congress, second session. The improvement of this harbor by the United States in the manner apparently desired is not deemed worthy of being undertaken at the present time.

2. Preliminary examination of Little Neck Bay, N. Y.—Report dated June 22, 1911, is printed in House Document No. 427, Sixty-second Congress, second session. The improvement by the United States of this locality in the manner apparently desired is not deemed advisable at the present time.

The local officer was also charged with the duty of making other preliminary examinations and surveys, provided for by the river and harbor acts approved June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. Manhasset Harbor, N. Y.

2. Fort Pond Bay, Suffolk County, N. Y.

3. New York Harbor, N. Y., with a view to securing a suitable depth of channel to the navy yard.

IMPROVEMENT OF RIVERS AND HARBORS IN THE THIRD NEW YORK, N. Y., DISTRICT.

This district was in the charge of Col. William T. Rossell, Corps of Engineers, division engineer, eastern division.

1. Passaic River, N. J.—This river is a stream of considerable size, rising among the highlands in the northern part of New Jersey and flowing in a generally easterly and southerly course into Newark Bay. It is navigable from its mouth to Passaic, a distance of about 16 miles, where navigation is cut off by the Dundee Water Power & Land Co.'s dam. In its natural condition the navigable depth to Newark was about 7 feet at mean low water; from Newark to Passaic it was about 3 feet.

Projects for improvement.—The first project for improvement, now existing in part, adopted by the river and harbor act of June 10, 1872, was for providing a channel, by diking and dredging, from Newark to Passaic from 6 to 7½ feet deep and from 50 to 200 feet wide, the first cost being estimated at $123,924. This was subsequently increased to $193,822. Up to June 30, 1912, $222,466.65 had been expended on this project, of which $150,734 was expended for improvement and $71,732.65 for maintenance work. The annual cost of maintenance is estimated at $5,000. This project is practically completed, a depth of 6 feet at mean low water and width of about 100 feet having been obtained.

The second project, now covered by third project, was for improving the river below Newark and was authorized by the river and harbor act of June 14, 1880, at an estimated cost of $353,875. It contemplated a channel 200 feet wide and 10 feet deep at mean low water up to Center Street Bridge, Newark.

The two projects (first and second) were consolidated by the river and harbor act of July 13, 1892, the estimated cost of the improvement being $547,697.

The amount expended under this consolidated project up to the close of the fiscal year ending June 30, 1912, was $512,293.19, of which $389,610 was used in carrying out the projects and $122,683.19 for maintenance.

The third project, adopted by the act of June 13, 1902, in accordance with the report submitted in House Document No. 401, Fifty-sixth Congress, first session, provides for making a channel from Staten Island Sound through Newark Bay and the said river to the Montclair & Greenwood Lake Railroad bridge, 200 feet in width, 12 feet deep to the Nairn Linoleum Works, and 10 feet deep from that point to the said railroad bridge, a total distance of 10.8 miles. The estimated cost was originally $296,000, but was subsequently increased, additional funds having been appropriated by the river and harbor act of March 3, 1905, and may now be stated at $323,274.60. Work under this project was authorized to be done under continuing contracts, the total amount of the contract authorization being now appropriated. The amount expended on this project up to the close of the fiscal year ending June 30, 1912, was $301,467.75, of which amount $127.96 was derived from sale of maps. This project was completed in 1911. It will be maintained until work under the fourth project covers the locality.

The fourth and existing project was adopted by the river and harbor act approved March 2, 1907, and it provides for making a channel 16 feet deep at mean low water 300 feet wide from deep water in Newark Bay to the Nairn Linoleum Works, 9.7 miles, thence 200 feet wide to the Montclair & Greenwood Lake Railroad bridge, 1.1 miles, in accordance with the report submitted in House Document No. 441, Fifty-ninth Congress, second session, estimated to cost $1,216,775. The act provided for an expenditure of $850,000 for prosecuting the work, of which $142,000 is yet to be appropriated under continuing-contract authorization. The amount expended on this project to the close of the fiscal year ending June 30, 1912, was $513,008.49, of which amount $2.40 was derived from sale of maps.

The river and harbor act of February 27, 1911, provided that the project for improvement below said bridge may, in the discretion of the Secretary of War, be so modified as to allow the widening of the channel at the bends where considered desirable in the interest of commerce and navigation; also that the cost of the project shall not be increased by such additional work beyond that stated in House Document No. 441, Fifty-ninth Congress, second session.

The third and fourth existing projects will eventually be covered by a project adopted by the river and harbor act approved July 25, 1912, for increasing the depth in Newark Bay and Passaic River to the Montclair & Greenwood Lake Railroad bridge to 20 feet at mean low water, in accordance with reports and estimates printed in House Document No. 707, Sixty-second Congress, second session.

During the fiscal year operations consisted in dredging under a continuing contract under project of 1907. Dredging was in progress at the beginning of the year, at which time 2,846,034 cubic yards of material had been removed. Dredging was continued through the year, and 278,965 cubic yards of material were removed. Of this amount 131,951 cubic yards were removed from the bend between the Pennsylvania Railroad freight and Jackson Street Bridges. Under this project the channel has thus far been dredged to the Bridge Street Bridge, Newark, a distance of about 8 miles from the beginning of the work in Newark Bay, with widths of from 150 to 300 feet. About three-fourths of the work proposed has been accomplished. Work was in progress at the close of the fiscal year.

The maximum drafts that could be carried June 30, 1912, were as follows: 16 feet in Newark Bay and Passaic River to Newark & New York Railroad bridge, 14 to 15 feet to Bridge Street Bridge, 12 feet to New York, Lake Erie & Western Railroad bridge, 10 feet to Montclair & Greenwood Lake Railroad bridge, and 6 feet to the city of

Passaic. Mean range of tides at mouth of river 4.7 feet and at Passaic 3.5 feet.

It is proposed to apply the available balance and the amount to be appropriated to continuation and maintenance of the improvement in accordance with the adopted projects.

The commerce of this river is mainly in building material, iron ore, fertilizers, coal, and general merchandise, and amounted to 2,037,363 tons in 1900; to 2,009,356 tons in 1901; to 2,494,312 tons in 1902; to 2,356,511 tons in 1903; to 2,567,942 tons in 1904; to 2,567,000 tons in 1905; to 2,577,188 tons in 1906 and 1907, valued at $167,113,305; in 1908 to 2,110,959 tons, valued at $171,612,700; in 1909 to 2,650,809 short tons, valued at $164,800,203; and in 1910 to 2,266,291 short tons, valued at $62,216,587, including the commerce of Hackensack River, which passes through Newark Bay. Tonnage reported before 1908 in long tons since reported in short tons.

This improvement is necessary to the great industrial interests and has reduced freight rates $1 a ton on coal and building materials, and its continuance is necessary to the successful carrying on of the business of this locality.

Details as to this improvement may be found in the Annual Reports of the Chief of Engineers for 1896, pages 770–774, and for 1900, pages 177, 1530–1550.

Reference to reports of examinations and surveys.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Page.	Part.
Newark to Rutherford Park	Senate	[1] 35	Forty-second	Second	1872 [1,2]	807	1
Passaic to Paterson	do	[3] 164	Forty-eighth	First	1884 [1,2]	780	1
Staten Island Sound to Paterson.	House	[3] 401	Fifty-sixth	do	1900 [1,2]	1530	1
Staten Island Sound to Montclair & Greenwood Lake R. R. bridge.	do	[1] 441	Fifty-ninth	Second	1907 [1]	175	1
Channel along east shore of Newark Bay.	do	[1] 80	Sixty-first	First	1909 [1]	187	1
Newark Bay, Passaic, and Hackensack Rivers.	do	[1] 707	Sixty-second	Second			
Passaic River above Montclair & Greenwood R. R. bridge.	do	[1] 722	do	do			

[1] No map. [2] Contains report. [3] Contains map.

Maps showing mouth of river and Newark Bay are printed in the Annual Reports of the Chief of Engineers for 1882, page 686, and 1887, page 766, and of the full length of the bay and river under improvement in the Annual Report of the Chief of Engineers for 1905, page 1030, and in House Document No. 393, Fifty-second Congress, first session.

PROJECTS OF 1872, 1902, AND 1907.

July 1, 1911, balance unexpended	$282, 211. 40
Amount received from sale of maps	19. 96
	282, 231. 36
June 30, 1912, amount expended during fiscal year, for works of improvement	51, 464. 41

July 1, 1912, balance unexpended	$230, 766. 95
July 1, 1912, outstanding liabilities	34, 829. 78
July 1, 1912, balance available	195, 937. 17
Amount appropriated by sundry civil act approved Aug. 24, 1912	33, 000. 00
Amount appropriated by river and harbor act approved July 25, 1912	5, 000. 00
Amount available for fiscal year ending June 30, 1913	233, 937. 17
July 1, 1912, amount covered by uncompleted contracts	192, 410 07
Amount of continuing contract authorization, act of Mar. 2, 1907	650, 000. 00
Amount appropriated under such authorization	508, 000. 00
Amount yet to be appropriated	142, 000. 00
Amount (estimated) required to be appropriated for completion of existing projects	[1] 508, 775. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 100, 000. 00

PROJECT OF JULY 25, 1912.

Amount appropriated by river and harbor act approved July 25, 1912	$5, 000. 00
Amount available for fiscal year ending June 30, 1913	5, 000. 00
Amount (estimated) required to be appropriated for completion of existing project	[1] 1, 059, 800. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 300, 000. 00

(See Appendix G 1.)

2. *Hackensack River, N. J.*—The Hackensack River rises near Haverstraw, Rockland County, N. Y., and flows south, emptying into the head of Newark Bay, about 34 miles in a direct line from the source. The river is tidal and navigable to New Milford, about 20 miles from the mouth, where navigation is cut off by low dams of the Hackensack Water Co. Navigation above Hackensack is limited to boats of light draft. The lower part of the watershed is occupied by tidal meadows about 4 miles wide and 10 miles long; these meadows are but a few inches above the level of high tide. The principal navigable tidal tributaries of the Hackensack River are Overpeck Creek from the east at Little Ferry, 13 miles from the mouth, and Berrys Creek from the west, about halfway between Little Ferry and the mouth of the river. These tributaries are crossed by drawbridges and are navigable for distances of about 3½ miles from the Hackensack River. The river has very little slope between the mouth and Hackensack. The mean range of tide is about 4¾ feet at the mouth, and about 5 feet at Hackensack.

The following table shows distances by course of river from the mouth to certain points on the river:

	Miles.
Mouth to Saw Mill Creek (Snake Hill)	5
Saw Mill Creek to Berrys Creek	1¾
Berrys Creek to Little Ferry Bridge and Overpeck Creek Bridge	6
Little Ferry Bridge to Court Street	2¼
Court Street to Anderson Street	1
Anderson Street to New Milford	4
Total	20

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[1] Exclusive of amount available for fiscal year 1913.

In its original condition the mouth of the river was obstructed by bars extending from the junction with the Passaic River to the Newark and New York railroad bridge, a distance of about a mile, which limited practical navigation to a depth of about 8 feet at mean low water. After crossing these shoals near the mouth of the river, there was a depth of 12 feet and over to Little Ferry. From Little Ferry to Hackensack the limiting depth was from 5 to 6 feet at mean low water.

The project for the improvement of the Hackensack River, adopted by the river and harbor act approved July 25, 1912, is in accordance with plan printed in House Document No. 643, Sixty-first Congress, second session, and provides for making and maintaining, by dredging, a channel 12 feet deep at mean low water; the width to be 200 feet from Newark Bay to Little Ferry, thence 150 feet to the New York, Susquehanna & Western Railroad bridge, at an estimated cost of $171,018.10, and $6,000 per annum for maintenance.

There has been nothing expended on this work as yet, or any operations during the fiscal year.

The commerce of this river, mainly in coal, building material, and clay products, amounted in 1911 to 314,256 short tons, valued at $1,623,342.

It is proposed to apply the amount appropriated and the amount recommended to be appropriated to carrying out the improvment.

Reference to reports of examinations and surveys.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Page.	Part.
Lower bridge, Hackensack, to Erie Railroad bridge.					1889 [1, 2]	841	1
Newark Bay to Hackensack					1891 [2, 3]	1016	2
Newark Bay to Anderson Street Bridge, Hackensack.	House	[1] 643	Sixty-first	Second	1910 [2]	212	1

Amount appropriated by river and harbor act approved July 25, 1912	$50,000.00
Amount available for fiscal year ending June 30, 1913	50,000.00
Amount (estimated) required to be appropriated for completion of existing project	[4] 121,018.10
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[4] 50,000.00

(See Appendix G 2.)

3. Arthur Kill, or Staten Island Sound, and channel north of Shooters Island, between New York and New Jersey.—(*a*) *Arthur Kill, or Staten Island Sound, New York and New Jersey.*—This is a waterway about 12 miles long, which, together with the lower end of Newark Bay, 2 miles long, and the Kill Van Kull, 3 miles long, forms the inland waterway between upper New York Harbor and

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[1] Contains map.
[2] Contains report.
[3] No map.
[4] Exclusive of amount available for fiscal year 1913.

Raritan Bay. The section now contemplated under this improvement consists of the 14 miles of channel between Kill Van Kull and Raritan Bay. The original depth through the Arthur Kill, or Staten Island Sound, at mean low water was 15 feet and upward. in a channel 100 to 1,000 feet in width. Through the lower end of Newark Bay the navigable channel depth was about 14 feet at mean low water, the result of an improvement commenced in 1874 and continued up to the present time. In the present project the new channel was cut through the flats to the southward of the original channel, on which the depth was 1 to 2 feet at mean low water.

Projects: Sections of this waterway have been under improvement by the United States under the titles of "Channel between Staten Island and New Jersey," adopted in 1880, superseding the project of 1874, and "Arthur Kill," adopted in 1888. The former provided for a depth of 14 feet and width of 400 feet through the lower part of Newark Bay, and the latter for the removal of Steep Point, in order to straighten the channel to the southwestward of the Baltimore & Ohio Railroad bridge.

Under these projects a training dike 2,237 feet long was completed, a channel dredged 14 feet deep at mean low water and 400 feet wide through the shoal in Newark Bay, Steep Point was removed, and a channel dredged in Lemon Creek 8 feet deep at high water and from 35 to 50 feet wide. The total amount expended on this work to June 30, 1911, was $319,062.64, of which $156,635.08 was for original dredging, including in this amount $8,242.13 for work in Lemon Creek; $50,000 was for dike construction and $112,427.56 for maintenance, leaving a balance of $12,437.36 to be applied to maintenance in connection with the later adopted projects.

The existing project for this improvement, which is printed in House Document No. 393, Fifty-sixth Congress, first session, was adopted by the river and harbor act approved June 13, 1902, and provides for making and maintaining a channel from Kill Van Kull to Raritan Bay, New York and New Jersey, by means of dredging and diking, 300 feet wide and 21 feet deep at mean low water, at an estimated cost of $696,000, and $5,000 for annual cost of maintenance. Experience indicates that the annual cost of maintenance will be not less than $25,000. Work under this project was authorized to be done under continuing contracts, the full amount authorized having been appropriated. The amount expended on the project to June 30, 1912, was $626,357.36, of which amount $626,261.25 was used in carrying out the project and $96.11 for maintenance, and $2,853.50 additional for a harbor-line survey. The sum of $130.56 was derived from the sale of maps.

Operations during the past fiscal year consisted of rock removal at the Baltimore & Ohio Railroad bridge; 21,865 cubic yards of material were removed under this contract from February to June, inclusive. The plant arrived on the work December 26, 1911, chiseling was commenced December 30, and dredging was begun February 7, 1912. Work was in progress at the close of the year.

The dredging contemplated by this project has been completed and the 21-foot channel has been dredged through the waterway, with a width of about 300 feet.

The maximum draft that could be carried through the entire length of the improved waterway on June 30, 1912, was 20 to 21 feet at mean low water. Mean range of tides, 5 feet.

It is proposed to apply the available funds to dredging for maintenance, in accordance with the adopted project. The appropriation recommended will be applied to maintenance.

The freight carried through this waterway consists of oil, coal, ores, clay products, chemicals, fertilizers, grain, machinery, manufactures, and general merchandise, and amounted in 1899 to 11,311,991 tons; in 1901 to 11,651,300 tons; in 1902 to 14,517,079 tons; in 1903 to 11,512,420 tons; in 1905 to 11,721,861 tons, valued at $265,193,813; in 1906 to 16,574,840 tons, valued at $355,579,817; in 1907 to 14,948,077 tons, valued at $245,032,666; in 1908 to 15,995,231 tons valued at $239,395,113; in 1909 to 15,629,768 tons, valued at $249,114,846; in 1910 to 15,930,332 tons, valued at $230,449,455; and in 1911 to 17,800,977 tons, valued at $263,352,020. Tonnage reported before 1908 in long tons; since reported in short tons.

It appears from inquiry that no estimate can be made of the exact effect of the project on freight rates, except as to the local commerce upon which the rates have been reduced by this improvement.

References to reports of examinations and surveys.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Page.	Part
Newark Bay to Elizabethport	Senate	[1] 52	Forty-second	Third	1873 [1]	[2] 943	1
Do	House	[1] 44	Forty-fourth	First	1876 [1]	[2] 251	1
Baltimore & Ohio R. R. bridge	Senate	[3] 17	Forty-ninth	Second	1887 [1]	[2] 2632	4
Channel west of Robbins Reef Light.	House	[1] 77	Fifty-second	do	1893 [1]	[2] 1083	1
Kill Van Kull to Raritan Bay	do	[3] 393	Fifty-sixth	First	1900 [1]	[2] 1525	1
Vicinity of Piles Creek	do	[1] 591	Fifty-ninth	do			
Kill Van Kull to point in vicinity of Bedloes Island, west of Robbins Reef.	do	[1] 278	do	Second	1907 [1]	175	1
Westerly side of Buckwheat Island	do	[1] 533	Sixtieth	First	1908 [1]	184	1

Maps of this work are printed in Annual Report of the Chief of Engineers for 1881, page 696; 1899, pages 820–822; 1890, page 844; 1905, page 1034; and for 1911, page 1322; and in House Document No. 393, Fifty-sixth Congress, first session.

July 1, 1911, balance unexpended		[4] $135, 477. 46
Amount received from sale of maps		56. 00
		135, 533. 46
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$56, 075. 74	
For maintenance of improvement	96. 11	
		56, 171. 85
July 1, 1912, balance unexpended		79, 361. 61
July 1, 1912, outstanding liabilities		38, 978. 31

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[1] No map.
[2] Contains report.
[3] Contains map.
[4] Including balance of funds remaining from appropriations for improvement of channel between Staten Island and New Jersey.

July 1, 1912, balance available	$40,383.30
Amount appropriated by river and harbor act approved July 25, 1912	20,000.00
Amount available for fiscal year ending June 30, 1913	60,383.30
July 1, 1912, amount covered by uncompleted contracts	6,063.40
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1][2]30,000.00

(*b*) *Channel north of Shooters Island between New York and New Jersey.*—This is an extension of the existing project for the improvement of Arthur Kill or Staten Island Sound from Kill Van Kull to Raritan Bay. Before improvement there was no channel within the limits covered by this project, the locality being a part of the flats at the lower end of Newark Bay, except at the western end which is a part of the old channel improved under the head of the channel between Staten Island and New Jersey. The object of this channel is to relieve the congestion in navigation of the main channel south of Shooters Island. In its natural condition the central and eastern part of this new waterway was a part of the flats referred to on which the depth was from 2 to 5 feet at mean low water. The length of this channel is about 1 mile, with a width of 300 feet and depth at mean low water of 16 feet.

This project also includes the removal of a middle ground in the main channel of Newark Bay, northeast of Shooters Island, between Bergen Point and Shooters Island; the removal of a part of Bergen Point Reef and the middle ground at Corner Stake Light, at an estimated cost of $280,115, with $5,000 annually for maintenance. Provision was made for this project in the river and harbor act approved June 25, 1910, in accordance with plan printed in House Document No. 337, Fifty-ninth Congress, second session.

The amount expended on the project up to the close of the fiscal year ending June 30, 1912, was $122,838.83, which was for work of improvement.

Operations during the fiscal year consisted in dredging under a continuing-contract authorization of $180,115, made by the river and harbor act of June 25, 1910, of which $60,115 remains to be appropriated. Dredging was in progress at the beginning of the year, at which time 380,094 cubic yards had been removed from the channel. During July to January, inclusive, and March to May, inclusive, 231,005 cubic yards of material were removed from the channel. During September to April, inclusive, 148,165 cubic yards were removed from the middle ground at Corner Stake Light. This part of the work is nearly completed, having depths from 13 to 16 feet at mean low water; it is being used. Work was in progress at the end of the year on the middle ground in Newark Bay from which 39,447 cubic yards were removed during May and June. Total yardage removed to end of fiscal year, 418,617.

The mean range of tides is 5 feet. This is a connecting channel, and the commerce to be benefited will be a part of the Arthur Kill, which in 1911 amounted to 17,800,977 short tons, with an estimated value of $263,352.020, and of Newark Bay and Passaic River, amounting in 1910 to 2,266,291 short tons, with a value of $62,216,587.

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[1] Exclusive of amount available for fiscal year 1913.
[2] Including maintenance of channel north of Shooters Island.

Report of examination and survey was printed in House Document No. 337, Fifty-ninth Congress, second session, with map.

It is proposed to apply the available balance to continuing the improvement.

July 1, 1911, balance unexpended	$140,105.74
June 30, 1912, amount expended during fiscal year, for works of improvement	72,944.57
July 1, 1912, balance unexpended	67,161.17
July 1, 1912, outstanding liabilities	11,153.99
July 1, 1912, balance available	56,007.18
Amount appropriated by sundry civil act approved Aug. 24, 1912	30,000.00
Amount available for fiscal year ending June 30, 1913	86,007.18
July 1, 1912, amount covered by uncompleted contracts	27,644.31
Amount of continuing contract authorization, act of June 25, 1910	180,115.00
Amount appropriated under such authorization	120,000.00
Amount yet to be appropriated	60,115.00
Amount (estimated) required to be appropriated for completion of existing project	[1]60,115.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	([2])

CONSOLIDATED.

July 1, 1911, balance unexpended		$275,583.20
Amount received from sale of maps		56.00
		275,639.20
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$129,020.31	
For maintenance of improvement	96.11	
		129,116.42
July 1, 1912, balance unexpended		146,522.78
July 1, 1912, outstanding liabilities		50,132.30
July 1, 1912, balance available		96,390.48
Amount appropriated by river and harbor act approved July 25, 1912		20,000.00
Amount appropriated by sundry civil act approved Aug. 24, 1912		30,000.00
Amount available for fiscal year ending June 30, 1913		146,390.48
July 1, 1912, amount covered by uncompleted contracts		33,707.71
Amount of continuing contract authorization, act of June 25, 1910		180,115.00
Amount appropriated under such authorization		120,000.00
Amount yet to be appropriated		60,115.00
Amount (estimated) required to be appropriated for completion of existing project		[1]60,115.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1]30,000.00

(See Appendix G 3.)

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[1] Exclusive of amount available for fiscal year 1913.

[2] See money statement for Arthur Kill, or Staten Island Sound, p. 261 of this report.

4. Woodbridge Creek, N. J.—This creek is a small, crooked tidal stream about 5 miles long, running through flat marshes for most of its length and emptying into the west side of Arthur Kill, or Staten Island Sound, 2 miles north of Perth Amboy, N. J.

It is navigable for 2⅜ miles above the mouth to a point where it is crossed by a highway bridge without a draw. The width of the creek below this bridge is about 100 feet. In its original condition this stream was obstructed at its mouth by a bar having a least depth of 9.8 feet at high water and by two shoals just inside the mouth. From these shoals a good 12-foot channel at high water existed to above Anderson's brickworks, seven-eighths of a mile from the mouth, above which point, however, many shoals occurred, although a narrow 8-foot channel existed as far as Salamander Dock, 1⅞ miles from the mouth.

First project: A survey of the navigable part of this creek was made in 1878, and a project for its improvement was adopted by the river and harbor act of March 3, 1879. This project provided for forming a channel 12 feet deep at mean high water and 80 feet wide from the mouth of the creek to the Salamander Dock, at an estimated cost of $13,800, which amount was increased in 1884 to $29,000. Work on this improvement was carried on under appropriations made from 1879 to 1882, amounting to $19,000, which was expended without completing the project, and was suspended in 1883, and in 1900 the channel had relapsed to its original condition.

The existing project, printed in House Document No. 282, Fifty-sixth Congress, first session, and adopted by the river and harbor act of June 13, 1902, contemplates obtaining a channel 8 feet deep at mean low water, with a bottom width of 50 feet, by dredging, from Arthur Kill to Salamander Dock, at an estimated cost of $35,000 for the improvement and $3,000 annually for maintenance.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $54,482.43, of which $30,822.70 was used in carrying out the project, and $23,659.73 for maintenance. This project was completed in January, 1908, under appropriation of March 2, 1907.

No work was done during the fiscal year. The expenditure was for notary fee.

The maximum mean low-water draft that could be carried June 30, 1912, throughout the improvement was 8 feet for nine-tenths and 6 feet for one-tenth of its length. The mean range of tides is 5 feet.

The commerce of this creek, mainly in clay, brick, tile, coal, tin scrap, steel scrap, and building materials, amounted in 1887 to 126,000 tons; in 1908 to 176,000 tons; in 1903 to 155,751 tons; in 1905 to 160,194 tons, valued at $1,018,198; in 1907 to 151,671 tons, valued at $1,071,548; in 1908 to 163,120 tons, valued at $791,700; in 1909 to 116,459 tons, valued at $587,164; in 1910 to 129,676 tons, valued at $675,000; and in 1911 to 128,560 tons, valued at $680,825. Tonnage reported since 1907 in short tons, previous reports in long tons.

It appears from inquiry that freight rates have been reduced as a result of this improvement.

It is proposed to apply the available balance, and the sum recommended to be appropriated, to maintenance of the improvement.

Reports of examinations and surveys were printed in Annual Reports of the Chief of Engineers for 1879, page 478, and 1900, page 1552, without maps; and in House Document No. 282, Fifty-sixth Congress, first session, with map.

Map of the creek is printed in Annual Report of the Chief of Engineers for 1905, page 1036.

July 1, 1911, balance unexpended	$267.69
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	.12
July 1, 1912, balance unexpended	267.57
Amount appropriated by river and harbor act approved July 25, 1912	6,000.00
Amount available for fiscal year ending June 30, 1913	6,267.57
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]3,000.00

(See Appendix G 4.)

5. Raritan Bay, N. J.—This bay is a large body of water lying between the southern end of Staten Island and the New Jersey shore and lower New York Bay on the east. Its greatest width north and south is about 5 miles, and its greatest length east and west is about 7 miles. The Raritan River empties into it at its west end between Perth Amboy and South Amboy, and the Arthur Kill or Staten Island Sound extends northward from its west end connecting it with Newark Bay.

This bay had naturally a fairly straight channel, 11 feet deep, to South Amboy. The line of the deepest water, however, followed the Staten Island shore from Perth Amboy to Seguine Point, where it was separated from deep water in the eastern part of the bay by a shoal 1.5 miles broad, with a minimum depth of 14.5 feet.

The original and existing project, adopted March 3, 1881, and extended September 19, 1890, and June 3, 1896, provides for dredging channels 300 feet wide and 21 feet deep from Seguine Point to deep water in the bay, a distance of about 1.5 miles, through two shoals opposite Wards Point, 0.4 and 0.6 mile long, respectively, and from South Amboy to deep water near Great Beds Light, a distance of about 1.5 miles. The estimated cost of the work was $507,875, and $20,000 annually for maintenance.

The amount expended on the work up to the close of the fiscal year ending June 30, 1912, was $618,015.72, of which $297,314.45 was used in carrying out the project, and $320,701.27 for maintenance. Of this amount $9.81 was derived from the sale of maps. The existing project has been completed, and the work now contemplated is maintenance of the improvement.

Operations during the fiscal year consisted in dredging under contract with P. Sanford Ross (Inc.); 86,000 cubic yards were removed from Wards Point channel during December, January, March, and April, making 21-foot depth at mean low water, and 150 feet width across a shoal connecting deep water near Seguine Point and Great Beds Light.

It is proposed to apply the available balance and the amount recommended to be appropriated to maintenance of the improvement.

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[1] Exclusive of amount available for fiscal year 1913.

The maximum draft that could be carried June 30, 1912, through the Wards Point, South Amboy, and Seguine Point Channels was about 20–21 feet at mean low water. Mean range of tides, 5 feet.

The commerce of the bay is mainly in coal, brick, refined lead, and copper, bullion, clay products, and general merchandise, and amounted in 1901 to 4,722,048 tons; in 1902 to 5,453,122 tons; in 1903 to 4,484,152 tons; in 1905 to 5,296,986 tons; in 1906 to 6,432,245 tons, valued at $114,358,610; in 1907 to 7,424,414 tons, valued at $139,228,344; in 1908 to 8,729,748 tons, valued at $136,550,115; in 1909 to 8,283,839 tons, valued at $107,829,053; in 1910 to 9,168,913 tons, valued at $132,234,295; and in 1911 to 10,078,774 tons, valued at $149,933,596. Tonnage before 1908 reported in long tons; since reported in short tons.

It appears from statements of the shipping interests of the great railroad terminals that the improvements have resulted in a reduction of towing rates and a proportionate reduction of freight rates, owing to the greater quantity of coal that can be carried and towed through these channels over that which was carried before the improvement was made.

Further details of this improvement are printed in the Annual Report of the Chief of Engineers for 1896, pages 787–789.

Reference to reports of examinations and surveys.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Page.	Part.
Perth Amboy and South Amboy ship channel.	House	[1] 45	Forty-sixth	Third	1881 [1, 2]	717	1
Princess Bay, Staten Island (breakwater).	do	[3] 109	Fifty-first	Second	1891 [1, 2]	1013	2
South Amboy to Great Beds	do	[3] 298	Fifty-third	Third	1895 [1, 2]	1014	1
South Amboy to Great Beds Light.	do	[1] 184	Fifty-eighth	Second	1904 [1, 2]	1158	1

Maps are printed in Annual Reports of the Chief of Engineers for 1905, page 1038, and for 1911, page 1330.

July 1, 1911, balance unexpended	$27, 363. 82
Amount received from sale of maps	4. 36
	27, 368. 18
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	22, 872. 54
July 1, 1912, balance unexpended	4, 495. 64
Amount appropriated by river and harbor act approved July 25, 1912	10, 000. 00
Amount available for fiscal year ending June 30, 1913	14, 495. 64
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[4] 20, 000. 00

(See Appendix G 5.)

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[1] No map.

[2] Contains report.

[3] Contains map.

[4] Exclusive of amount available for fiscal year 1913.

6. Keyport Harbor, Matawan Creek, Raritan and South Rivers, Shoal Harbor and Compton Creek, and Cheesequake Creek, N. J.—(*a*) *Keyport Harbor.*—This harbor is situated at the mouth of Matawan Creek, on the south side of Raritan Bay, 5 miles east of the mouth of Raritan River, and it consists of a bay about 1 mile broad.

There was no distinct natural channel in the harbor, the available depth to the wharves being less than 4 feet at mean low water. A 6-foot channel had been dredged at private expense before the United States assumed charge of the improvement, but it had shoaled again to 3 feet.

The original and existing project, approved August 2, 1882, with subsequent modifications (1883), contemplates dredging a channel 8 feet deep at mean low water, about 4,700 feet long and 200 feet wide. from Raritan Bay to the steamboat dock at Keyport, at an estimated cost of $40,475.

The amount expended to June 30, 1912, was $90,426.80, of which sum $40,475 was used in carrying out the project and $49,951.80 for maintenance. A channel of the required length and nearly the proposed width was completed in 1883–84. The improvement has been practically completed. Maintenance is necessary.

Under an allotment of $18,872.74 from the consolidated appropriation made by the river and harbor act of June 25, 1910, and balance from previous allotment, dredging under contract was in progress at the beginning of the fiscal year, at which time 20,263 cubic yards had been removed. During July to October, inclusive, 65,655 cubic yards of material were removed, making a total of 85,918 cubic yards for the contract, which restored the channel to projected dimensions.

The maximum draft that could be carried June 30, 1912, to the Keyport wharves was about 8 feet at mean low water. Mean range of tides, 4.9 feet.

The commerce of this harbor is mainly in farm products, fertilizers, coal, lumber, fish, shellfish, and miscellaneous freight, and, including the commerce of Matawan Creek, amounted in 1899 to 138,500 tons; in 1901 to 105,000 tons; in 1902 to 123,500 tons, valued at $2,893,000; in 1904 to 99.600 tons, valued at $2,022,000; in 1905 to 86,821 tons, valued at $2,202,105; in 1906 to 229,377 tons, valued at $3,074,060; in 1907 to 160,925 tons, valued at $3,275,305; in 1908 to 123,724 tons, valued at $3,146,800; in 1909 to 50,932 tons, valued at $1,345,020; in 1910 to 77,998 tons, valued at $1,783,136; and in 1911 to 96,477 tons, valued at $1,868,650. Tonnage reported since 1907 in short tions; previous reports in long tons.

The effect of this improvement has been to greatly reduce freight rates, especially in the marketing season.

It is proposed to apply the available balance, and the amount to be appropriated to maintenance of the improvement, in accordance with the adopted project.

Further details as to this work are printed in the Annual Report of the Chief of Engineers for 1897, pages 1147–1148.

Report of examination and survey is printed in House Document No. 153, Forty-second Congress, third session, without map. and in the Annual Report of the Chief of Engineers for 1873, page 941, without map.

Map is printed in the Annual Report of the Chief of Engineers for 1905, page 1040.

July 1, 1911, balance unexpended		$23,275.35
Amount received from sale of maps		1.00
		23,276.35
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$9,975.00	
For maintenance of improvement	5,673.44	
		15,648.44
July 1, 1912, balance unexpended		7,627.91
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		5,000.00
Amount available for fiscal year ending June 30, 1913		12,627.91
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		(1)

(*b*) *Matawan Creek.*—This creek is a small tidal stream in the eastern part of New Jersey which discharges into Raritan Bay through Keyport Harbor. It is navigable up to the bridge of the New York & Long Branch Railroad, about 2 miles above its mouth.

In its natural condition the mouth was obstructed by a mud flat, through which a narrow and crooked 3-foot channel existed. Above this flat there was a 4-foot channel for a mile and beyond a narrow 3-foot channel extending nearly up to the head of navigation at Matawan.

The original and existing project for improving this stream, by dredging a 4-foot channel 100 feet wide from the mouth to Winkson Creek, about 1 mile, and thence 75 feet wide to the railroad bridge at Matawan, was adopted March 3, 1881. The cost was estimated at $33,120.

The amount expended to June 30, 1912, was $65,647.96, of which $21,000 was used in carrying out the project, and $44,647.96 for maintenance. Of this amount $1.50 was derived from the sale of maps. About two-thirds of the work proposed under the project has been completed, and a channel has been dredged the required distance with widths of 50 to 100 feet, but this channel has greatly deteriorated.

No work was done during the year. Expenditures were for contingencies, final payment to contractor for dredging in last fiscal year, and for retained percentages.

Under allotment from appropriation made by river and harbor act approved February 27, 1911, a contract has been entered into for dredging. At the close of the fiscal year work had not been commenced.

The maximum draft at mean low water that could be carried June 30, 1912, to the head of navigation was about 4 feet for three-quarters of the distance and 2 feet for the remainder. Mean range of tides, 4.9 feet.

The commerce of this creek is in brick and fireproofing, fertilizer, shellfish, top soil, coal, and general merchandise, and amounted to

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[1] See consolidated money statement on page 275.

51,000 tons in 1899, to 60,000 tons in 1901, to 61,500 tons in 1902, valued at $1,265,000; to 29,600 tons in 1904, valued at $74,000; to 58,471 tons in 1905, valued at $203,955; in 1906 to 128,181 tons, valued at $717,505; in 1907 to 40,900 tons, valued at $163,500; in 1908 to 10,167 tons, valued at $38,265; in 1909 to 16,800 tons, valued at $22,000; in 1910 to 41,420 tons, valued at $46,620; and in 1911 to 48,745 tons, valued at $86,050. Tonnage reported since 1907 in short tons; previous reports in long tons.

The effect of this improvement has been to greatly reduce rates of freight, especially in the marketing season. Recent appropriations have been insufficient to maintain the channel in the upper part of the creek, where the market boats load, consequently that branch of the commerce has been abandoned.

It is proposed to expend the amount to be appropriated for maintenance of the project.

Further details as to this improvement may be found in the Annual Report of the Chief of Engineers for 1897, page 1145.

Report of examination and survey is printed in House Document No. 45, Forty-sixth Congress, third session, without map, and in Annual Report of the Chief of Engineers for 1881, page 720, without map.

Maps are printed in the Annual Report of the Chief of Engineers for 1905, page 1042.

July 1, 1911, balance unexpended	$6, 208. 73
Amount received from sale of maps	1. 50
	6, 210. 23
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	3, 052. 30
July 1, 1912, balance unexpended	3, 157. 93
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	6, 000. 00
Amount available for fiscal year ending June 30, 1913	9, 157. 93
July 1, 1912, amount covered by uncompleted contracts	2, 500. 01
Amount (estimated) required to be appropriated for completion of existing project	[1] 12, 120. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	([2])

(*c*) *Raritan River.*—This river is a moderate-sized stream, flowing through the central part of the State of New Jersey and emptying into Raritan Bay at Perth Amboy. It is navigable to New Brunswick, N. J., a distance of 12 miles, where it is the eastern terminus of the Delaware and Raritan Canal.

In its natural state the channel to New Brunswick was obstructed by many extensive shoals, on which the depth was from 6½ to 8½ feet at mean low water, the shoals being in the upper 9 miles of the river.

The sum of $13,963, appropriated in the years 1836 and 1837, was expended in removing obstructions from the river at New Brunswick.

The existing project for improvement, adopted June 18, 1878, with subsequent modifications, provides for a channel 200 feet wide and

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[1] Exclusive of amount available for fiscal year 1913.

[2] See consolidated money statement on page 275.

10 feet deep from the mouth to the Delaware and Raritan Canal terminus at New Brunswick, including a south channel between Crab Island and Kearney's dock, with a length of about 2¼ miles, width of 100 feet, and depth of 5½ feet at mean low water, to be obtained by dredging, diking, and rock excavation, the cost being estimated at that time at $2,093,662. Recent and improved methods for doing such work have made it probable that this estimate will not exceed $1,035,000.

The amount expended upon the existing project up to the close of the fiscal year ended June 30, 1912, was $740,912.04, of which $659,192.32 was used in carrying on the work and $81,719.72 for maintaining that already done; of this amount $1.37 was derived from sale of condemned property and from sale of maps. About two-thirds of the work contemplated under the project has been completed, and the following work has been accomplished under the project: A channel 10 feet deep has been made from the mouth to the Delaware and Raritan Canal terminus at New Brunswick, the section through and below the reef at Whitehead's dock, 8 miles from the mouth, having a width of 200 feet and the section above the reef a width of 100 feet. South channel has been dredged to the projected depth and width for a length of about 4,000 feet, but has since shoaled to almost original depth. Five dikes have been built to maintain the channels.

No work was done during the fiscal year. Expenditures were for office expenses and contingencies.

Under an allotment of $21,994.39 from the consolidated appropriation made by the river and harbor act of June 25, 1910, a contract for dredging for maintenance has been entered into. At the close of the fiscal year work had not been commenced. Allotment from consolidated appropriation of February 27, 1911, will also be expended for maintenance.

It is proposed to apply the available balance and the amount recommended to be appropriated to maintaining the improvement.

On June 30, 1912, the maximum draft that could be carried in the river was 10 feet to within 1 mile of the head of navigation, and 9 feet for the remainder of the distance. Mean range of tides: At mouth of river, 5.1 feet; at New Brunswick, 5.56 feet.

The commerce of this river is principally in coal, ores, refined copper, lumber, building materials, and general merchandise, and, including the commerce of the South River, amounted in 1906 to 736,666 tons, valued at $17,377,645; in 1907 to 725,690 tons, valued at $32,678,472; in 1908 to 918,302 tons, valued at $26,401,439; in 1909 to 936,533 tons, valued at $48,504,916; in 1910 to 963,473 tons, valued at $53,355,340; and in 1911 to 1,100,851 tons, valued at $64,441,303. Tonnage reported before 1908 in long tons; since reported in short tons.

It appears from numerous letters received that this improvement has resulted in a very material reduction of freight rates.

Details as to this improvement may be found in the Annual Reports of the Chief of Engineers for 1892, page 881; for 1896, page 780; for 1897, page 1136; and further information is contained in the report for 1900, page 1505.

Reference to reports of examinations and surveys.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Page.	Part.
Survey of 1832		[1] 306	Twenty-second	First			
Below New Brunswick, including Middle Grounds.	House	[1] 174	Forty-third	do	1874 [1,2]	173	2
Survey of 1853					1886 [1]	769	1

Maps of the river are printed in Annual Reports of the Chief of Engineers for 1885, page 760; for 1905, page 1044.

July 1, 1911, balance unexpended	$31,404.08
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	93.94
July 1, 1912, balance unexpended	31,310.14
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	36,310.14
July 1, 1912, amount covered by uncompleted contracts	17,909.91
Amount (estimated) required to be appropriated for completion of existing project	[3] 378,392.68
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	([4])

(*d*) *South River.*—This is a small stream in the central part of New Jersey, which discharges into the Raritan River about 8 miles above its mouth. Before improvement by the United States a private canal about three-fourths of a mile long had been dredged from near Washington, on the South River, to Sayreville, on the Raritan River, which shortened the sailing course about 2 miles.

The low-water depth in the canal was about 3.5 feet and in the river about 2.5 feet as far as Oldbridge, at the head of navigation, 6.3 miles above the canal.

The first project for this improvement was adopted March 3, 1871, and provided for dredging a channel 6 feet deep at mean low water up to the Washington wharves, at an estimated cost of $13,653. This was completed in 1874, at a cost of $20,000.

The existing project, adopted June 14, 1880, provides for correcting the canal outlet and for obtaining, by dredging and diking, a channel 100 feet wide and 8 feet deep to Washington, 1.5 miles above the mouth; thence 6 feet deep to Bissetts, 3.7 miles above the mouth; thence 4 feet deep to Oldbridge, 6.3 miles above the mouth, at th head of navigation. The cost was estimated at $194,695, but was reduced in 1892 to $176,695.

The amount expended on the present project up to the close of the fiscal year ending June 30, 1912, was $132,375.10, of which $92,077.03

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[1] No map.

[2] Contains report.

[3] Exclusive of amount available for fiscal year 1913.

[4] See consolidated money statement on page 275.

was used in carrying on the work and $40,298.07 for maintenance. Of this amount $1 was derived from sale of map. About one-half of the work contemplated under the project has been completed. Below the wharves at the village of South River or Washington a channel from 50 to 75 feet wide and 8 feet deep has been dredged, and the projected dikes have been built. Above Washington the proposed channel 100 feet wide and 6 feet deep, mean low water, has been completed to Bissetts Dock.

An addition to this project, adopted by the river and harbor act approved July 25, 1912, provides for making a channel between Bissetts and Oldbridge 6 feet deep at mean low water of the same width, 100 feet, proposed under the 4-foot project, at an estimated cost of $87,000, in accordance with report printed in House Document No. 520, Sixty-second Congress, second session. It is expeceted to carry out this addition to the project without increasing the cost of the improvement as originally submitted, except for maintenance, which is now estimated at $8,000.

Dredging was in operation at the beginning of the fiscal year under allotment of $19,380.63 from the consolidated appropriation made by the river and harbor act of June 25, 1910, and balance from previous allotment, at which time 13,589 cubic yards of material had been removed; 22,115 cubic yards were removed during July to September, inclusive, making a total of 35,704. A contract has been entered into for dredging in the river below Washington under balance from allotment from appropriation of June 25, 1910.

The maximum draft that could be carried to South River or Washington on June 30, 1912, was about 8 feet, thence to Bissetts, 5 to 6 feet, at mean low water. Mean range of tides: At canal, 5.34 feet; at Oldbridge, 4.57 feet.

Large brickyards established along the banks of the river give it a commercial importance out of proportion to its size.

The commerce is principally in brick, sand, clay, coal, fertilizer, and general merchandise, and amounted in 1899 to 343,202 tons; in 1902 to 387,246 tons; in 1904 to 392,626 tons; in 1905 to 260,204 tons, valued at $1,046,208; in 1906 to 226,227 tons, valued at $972,550; in 1907 to 118,549 tons, valued at $477,530; in 1908 to 99,197 tons, valued at $472,013; in 1909 to 133,587 tons, valued at $439,914; in 1910 to 127,170 tons, valued at $431,061; and in 1911 to 127,024 tons, valued at $480,411. Tonnage reported since 1907 in short tons; previous reports in long tons.

The improvement has caused a great reduction in freight rates, and it appears probable that the rates will be further reduced when the improvement reaches the upper stretches of the river. From reliable information received it appears that as a result of this improvement a reduction in freight rates on fire brick by rail to Boston of from $3.25 to $2 per ton has been made. The freight rate by rail to New York is $1.60 per ton; by water it is 75 cents per ton.

It is proposed to apply the amount recommended to be appropriated to maintaining the improvement in accordance with the adopted project.

Details as to this improvement may be found in the Annual Report of the Chief of Engineers for 1896, pages 784–785.

References to reports of examinations and surveys.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Page.	Part.
South River	House	[1] 60	Forty-first	Third	1871 [1] [2]	698	1
Raritan River to old bridge	Senate	[1] 69	Forty-sixth	Second	1880 [1] [3]	519	1
Old South River	House	[3] 335	Fifty-ninth	do	1907 [1]	175	1
Between Bissetts and old bridge	do	[3] 250	Sixty-second	do			

Sketches of South River are printed in the Annual Reports of the Chief of Engineers for 1882, page 678; 1885, page 764; and 1905, page 1046.

July 1, 1911, balance unexpended		$21,408.24
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$2,741.03	
For maintenance of improvement	5,482.05	
		8,223.08
July 1, 1912, balance unexpended		13,185.16
July 1, 1912, outstanding liabilities		1,067.55
July 1, 1912, balance available		12,117.61
Amount appropriated by river and harbor act approved July 25, 1912		87,000.00
Amount available for fiscal year ending June 30, 1913		99,117.61
July 1, 1912, amount covered by uncompleted contracts		5,499.98
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		([4])

(*e*) *Shoal Harbor and Compton Creek.*—This harbor is on the south shore of Raritan Bay, 5 miles from Sandy Hook. Compton Creek is a narrow stream emptying into it. The natural harbor for boats in Compton Creek is inside the mouth of the creek, where the depth is from 3 to 4 feet at mean low tide. The creek is navigable for about 1 mile above its mouth, where it is crossed by a railroad bridge without a draw. One-fourth of a mile above its mouth it is crossed by a highway drawbridge.

The entrance to this harbor was originally obstructed by a broad flat shoal on which there was a depth of less than 1 foot at mean low tide, the distance between the deep water in the creek and the 4-foot depth in the bay being about one-half mile.

The original and existing project, adopted September 19, 1890, proposes a channel 4 feet deep connecting Compton Creek with Raritan Bay, the width to be 150 feet in the bay and 75 feet in and near the mouth of the creek, the channel through Shoal Harbor to be protected by a dike if necessary, at an estimated cost of $64,130.

The amount expended to June 30, 1912, was $48,491.27, of which sum $17,000 was applied to carrying out the project and $31,491.27 for maintenance. Of this amount, $2.90 was derived from the sale of maps. About three-fifths of the dredging contemplated under this project has been completed, and a 4-foot channel 75 feet wide has been dredged through Shoal Harbor and Compton Creek, about two-thirds of a mile in length, connecting Raritan Bay with Compton Creek.

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[1] No map.
[2] Contains report.
[3] Contains map.
[4] See consolidated money statement on page 275.

A contract, under allotment of $8,572.24 from appropriation made by river and harbor act of June 25, 1910, was in force at the beginning of the year, although no work had been done. Fourteen thousand four hundred and forty-two cubic yards were removed during May and June, 1912. Another contract has been entered into for dredging for maintenance, under allotment of $5,000 from appropriation of February 27, 1911, under which no work has been done.

The maximum draft that could be carried June 30, 1912, in the improved channel through Shoal Harbor and Compton Creek to the drawbridge was about 4 feet at mean low water. Mean range of tides, 4.5 feet.

The commerce of this locality in farm and fish products, fertilizers, and general merchandise amounted to 180,000 tons in 1901; to 48,790 tons in 1902; to 65,175 tons in 1903; to 34,340 tons in 1905, valued at $1,198,200; in 1906 to 34,538 tons, valued at $1,167,920; in 1907 to 62,895 tons, valued at $1,809,380; in 1908 to 82,262 tons, valued at $1,510,210; in 1909 to 37,761 tons, valued at $490,975; in 1910 to 54,979 tons, valued at $999,895; and in 1911 to 61,702 tons, valued at $612,500. Tonnage reported since 1907 in short tons, previous reports in long tons.

It appears from statements received from shippers that there has been a reduction on coal freights of 40 per cent, on manure from 40 to 50 per cent, and on fish 20 per cent, as a result of this improvement, and if the improvement is not continued the rates would be very much advanced.

It is proposed to apply the available balance and the amount recommended to be appropriated to maintenance of the project.

Further details as to this improvement may be found in the Annual Report of the Chief of Engineers for 1897, page 1150.

Report of examination and survey is printed in Senate Document No. 80, Forty-eighth Congress, first session, with map, and in the Annual Report of the Chief of Engineers for 1884, page 770, without map.

Maps are printed in the Annual Report of the Chief of Engineers for 1905, page 1050.

July 1, 1911, balance unexpended	$14,837.50
Amount received from sale of maps	1.40
	14,838.90
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,824.46
July 1, 1912, balance unexpended	12,014.44
July 1, 1912, outstanding liabilities	4,124.94
July 1, 1912, balance available	7,889.50
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	12,889.50

July 1, 1912, amount covered by uncomplete contracts	$6,645.60
Amount (estimated) required to be appropriated for completion of existing project	[1] 47,130.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	([2])

(*f*) *Cheesequake Creek.*—This is a small stream in the eastern part of New Jersey which discharges into Raritan Bay, about 2 miles east of South Amboy. Before improvement by the United States the available navigable depth in the creek was 1½ feet at mean low water over the shoals, the distance from the entrance to the upper limit of navigation being 3½ miles.

The existing project was adopted June 14, 1880, and provided for a new outlet, 5 feet deep, from the creek into Raritan Bay, at right angles to the shore line through a beach which put across the mouth of the creek from the right bank and which had forced the outlet nearly one-half mile to the westward. This was to be obtained by dredging and constructing parallel jetties of stone, 200 feet apart, on each side of the dredged channel; the old outlet was to be closed by a pile dike, and a channel, 4 feet deep at mean low water and from 50 to 100 feet wide, was to be dredged from the mouth to the head of navigation, 3½ miles up the creek. In this distance two dikes were to be built and a new channel to be made through the marsh was to cut off a bend in the creek. Stump Creek, a tributary stream emptying into the creek near its mouth, was to be improved by dredging a channel 50 feet wide and 3 feet deep.

The cost was estimated at $75,279, which was revised in 1885, to $90,000.

The amount expended on the present project up to the close of the fiscal year ending June 30, 1912, was $53,810.25, of which $40,000 was used in carrying out the project, and $13,810.25 in maintenance. Of this amount $1.25 was derived from the sale of maps. About four-ninths of the work contemplated under this project has been completed, and the work accomplished consists of the construction of the two parallel stone jetties at the mouth, the dredging of a 5-foot channel between them about one-third mile in length connecting the creek with the 5-foot curve in Raritan Bay, and the construction of the pile dike closing the old outlet.

Work was in progress at the beginning of the fiscal year, at which time 5,641 cubic yards of material had been removed, and under an allotment of $5,000 from the consolidated appropriation made by the river and harbor act of June 25, 1910, 3,266 cubic yards of material were removed during July, 1912, making a total of 8,907 cubic yards under the contract.

The improvement has not advanced sufficiently to effect freight rates. It is proposed to expend the available balance, the allotment from appropriation of February 27, 1911, and amount recommended to be appropriated, in maintenance of the improvement.

The maximum draft at mean low water that could be carried through the mouth of the creek on June 30, 1912, was about 5 feet; mean range of tides, 5 feet.

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[1] Exclusive of amount available for fiscal year 1913.

[2] See consolidated money statement on page 275.

The commerce of the creek is principally in fertilizer, sand, brick, clay, and farm produce, and amounted in 1886 to about 50,000 tons; in 1905 to 45,500 tons, valued at $146,050; in 1906 to 83,648 tons, valued at $625,000; in 1907 to 89,500 tons, valued at $263,100; in 1908 to 79,520 tons, valued at $209,550; in 1909 to 61,880 tons, valued at $178,900; and in 1911 to 36,500 tons, valued at $277,500. Tonnage reported since 1907 in net tons; previous reports in gross tons.

Further details of this improvement may be found in the Annual Report of the Chief of Engineers for 1886, page 763.

Report of examination and survey is printed in Senate Document No. 69, Forty-sixth Congress, second session, without map, and in the Annual Report of the Chief of Engineers for 1880, page 525, without map. Reference to report of examination and survey is contained in Annual Report of the Chief of Engineers for 1905, page 152.

Sketches of Chesapeake Creek are printed in the Annual Reports of the Chief of Engineers for 1882, page 680, and for 1905, page 1051.

July 1, 1911, balance unexpended	$6,987.97
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	3,944.69
July 1, 1912, balance unexpended	3,043.28
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	2,500.00
Amount available for fiscal year ending June 30, 1913	5,543.28
Amount (estimated) required to be appropriated for completion of existing project	[1] 50,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	([2])

CONSOLIDATED.

July 1, 1911, balance unexpended		$104,121.87
Amount received from sale of maps		3.90
		104,125.77
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$12,716.03	
For maintenance of improvement	21,070.88	
		33,786.91
July 1, 1912, balance unexpended		70,338.86
July 1, 1912, outstanding liabilities		5,192.49
July 1, 1912, balance available		65,146.37
Amount appropriated by river and harbor act approved July 25, 1912		110,500.00
Amount available for fiscal year ending June 30, 1913		175,646.37
July 1, 1912, amount covered by uncompleted contracts		32,645.50
Amount (estimated) required to be appropriated for completion of existing project		[1] 482,642.68
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 33,500.00

(See Appendix G 6.)

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[1] Exclusive of amount available for fiscal year 1913.

[2] See consolidated money statement on this page.

7. *Shrewsbury River, N. J.*—This river is a large tidal basin in the eastern part of New Jersey, and consists of two bays, each having an area of about 3 square miles, and known, respectively, as the North Branch (or Navesink River) and the South Branch, and a channel called the main stem, which unites the two branches at their eastern ends and extends northwardly to the outlet at southeast end of Sandy Hook Bay. The river is navigable on the North Branch to Red Bank, 8 miles from the mouth, where it is crossed by three bridges without draws, and on the South Branch to Branchport, 9 miles from the mouth; also to Little Silver, Oceanport, Parkers Creek, North Long Branch, and Monmouth Beach, on the several arms of the South Branch.

The part of the river which has been under improvement by the United States consists of the main stem, the North Branch to Oceanic, 5 miles from the mouth, and the South Branch to the vicinity of Seabright, about 5⅓ miles from the mouth. The bays above Oceanic and Seabright had sufficient water to accommodate navigation.

Before any improvement was begun by the United States the available depth to Oceanic, on the North Branch, was 3½ feet, and to Seabright, on the South Branch, it was 2½ feet; the depth in the main stem was 4 feet. For details see Annual Report of the Chief of Engineers for 1886, page 756.

By act of Congress of August 30, 1852, $1,500 was appropriated for and expended upon a survey to ascertain the extent of a break through the beach between the Shrewsbury River and the ocean, but no work of improvement was begun.

First project: By act of Congress of July 11, 1870, a survey of the river was ordered. The report on this survey described a bar across the river nearly opposite the Navesink lights and four smaller bars above, and recommended deepening them by dredging, at an estimated cost of $14,000. The work was completed under appropriations amounting to $19,000, made in 1871 and 1873, and a new shoal near Lower Rocky Point was also dredged. The dredged channels did not long maintain the improved depth (6 feet at low tide).

Existing project, adopted March 3, 1879, with subsequent modifications, provides for forming a channel by means of dredging and diking, 6 feet in depth at mean low water, with width of 300 feet in the main stem, and widths from 150 to 200 feet in the north branch to Oceanic, and in the south branch to Seabright, at a modified estimated cost of $234,062. The approved estimate for annual maintenance is $10,000. A detailed description of the project is printed in the Annual Report of the Chief of Engineers for 1910, part 1, page 209. Report containing plan of improvement is printed in the Annual Report of the Chief of Engineers for 1879, part 1, page 405.

The sum expended under the existing project to the close of the fiscal year ending June 30, 1912, was $382,663.94, of which $195,393.95 was for carrying out the project, $187,269.99 for maintenance, and $5,000 for the survey made in 1903; of the total amount expended $18.25 was derived from the sale of maps. The project is completed, 9 dikes having been built and the channel dredged to 6 feet. Dredging and dike repairs are required for maintenance of channels.

No dredging was done during the fiscal year. Expenditures were for engineering and contingencies.

Advertisement under an appropriation of $10,000, made by the river and harbor act of February 27, 1911, for dredging, was answered by only one bid which, being considered too high, was rejected. This work will be placed in the open market.

At the beginning of the fiscal year the channels had been practically restored to projected dimensions, but have since shoaled.

The maximum draft that could be carried June 30, 1912, throughout the limits of the improvement was 5 to 6 feet at mean low water. Mean range of tides: Outer bar, 5 feet; Highlands Bridge, 3 feet; Seabright Bridge, 1.3 feet.

The commerce of the river, mainly in coal, farm products, fertilizer, and general merchandise, amounted in 1889 to 906,000 tons; in 1902 to 657,000 tons; in 1904 to 780,290 tons; in 1905 to 1,768,500 tons, valued at $8,215,000; in 1906 to 1,668,500 tons, valued at $7,235,000; in 1907 to 1,718,125 tons, valued at $6,629,750; in 1908 to 1,854,160 tons, valued at $6,270,000; in 1909 to 1,959,920 tons, valued at $7,320,000; and in 1910 to 1,608,600 tons, valued at $6,548,000. Tonnage reported before 1908 in long tons; since reported in short tons. The passenger traffic is important, the number of people carried by the Patten Line, South Branch, in 1902, being 264,635; in 1903, 277,257; in 1904, 266,157; in 1905, 310,367; in 1909, 331,641; and in 1910, 321,875; in addition to this, 106,837 passengers were carried by the Merchants' Line in 1909, making a total in 1909 of 438,478; and 150,000 in 1910, making a total of 471,875.

It is proposed to apply the available balance and the amount recommended to be appropriated to maintenance of the improvement in accordance with the project.

It appears from reports received from the Merchants' Steamboat Co. and the New York & Long Branch Steamboat Co. (Patten Line) that freight rates have been lowered, and maintained, as results of the improvement by the United States; also that the commerce has increased and that the improvement tends to keep the freight rates down.

Further details in reference to this work may be found in the Annual Reports of the Chief of Engineers for 1896, page 797, and 1900, page 185.

References to reports of examinations and surveys.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Page.	Part.
Break in beach near mouth (survey, 1852-3).					1886 [1]	756	1
North and South Branches and main stem.	House	[1] 60	Forty-first	Third	1871 [1] [2]	702	1
North and South Branches	do	[1] 38	Forty-fifth	do	1876 [1] [2]	278	1
North and South Branches and main stem.					1879 [2] [3]	405	1
Mouth to Red Bank and Branchport.	House	[3] 123	Fifty-eighth	Second	1904 [1] [2]	1162	1
Breakwater, Atlantic Highlands, Sandy Hook Bay.	do	[1] 86	Fifty-ninth	do	1907 [1]	175	1

[1] No map. [2] Contains report. [3] Contains map.

Sketches of Shrewsbury River are printed in the Annual Reports of the Chief of Engineers for 1881, 1882, 1887, 1890, 1891, 1892, 1893, and 1905, page 1054.

July 1, 1911, balance unexpended	$11,634.69
Amount received from sale of maps	2.37
	11,637.06
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	280.38
July 1, 1912, balance unexpended	11,356.68
Amount appropriated by river and harbor act approved July 25, 1912	10,000.00
Amount available for fiscal year ending June 30, 1913	21,356.68
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 10,000.00

(See Appendix G 7.)

8. *Removing sunken vessels or craft obstructing or endangering navigation:* (*a*) *Wreck of a schooner* (*name unknown*).—This vessel was found lying in the Passaic River, in the vicinity of Tompkins Bros.' dock, Newark, N. J., and the landing of the West Hudson Yacht Club, Kearney, N. J. First reported on May 4, 1912, and its removal completed May 31, 1912, at a cost of $850, which was an allotment from the permanent indefinite appropriation, act of March 3, 1899.

(*b*) *Wreck of schooner "Hattie E. King."*—This wreck was found floating in the mouth of the Arthur Kill, between Tottenville and Kreischerville, Staten Island, N. Y. First reported on June 24, and removed on June 26, 1912. Payment for work will be made on receipt of allotment of $60, requested under indefinite appropriation, act of March 3, 1899.

(See Appendix G 8.)

EXAMINATION AND SURVEY MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

Reports dated July 14, 1909, and April 8, 1910, on preliminary examination and survey, respectively, of *Passaic River, N. J., with a view to extending continuous navigation from the Montclair and Greenwood Lake Railroad Bridge to the city of Paterson*, required by the river and harbor act approved March 3, 1909, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbor, pursuant to law, and were transmitted to Congress and printed in House Document No. 722, Sixty-second Congress, second session. The improvement by the United States of this locality in the manner apparently desired is not deemed advisable at the present time.

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and surveys required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer.

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[1] Exclusive of amount available for fiscal year 1913.

They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. *Preliminary examination and survey of South River, N. J., between Bissetts and Oldbridge, with a view to deepening the channel to a depth of 6 feet.*—Reports dated December 21, 1910, and December 21, 1911, with map, are printed in House Document No. 520, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $87,000 for first construction, with $3,000 annually for maintenance, is presented.

2. *Preliminary examination, with plan and estimate of cost of improvement, of Newark Bay and Passaic and Hackensack Rivers, N. J.*—Reports dated October 28, 1911, and March 30, 1912, are printed in House Document No. 707, Sixty-second Congress, second session. A plan of improvement, at an estimated cost of $1,064,800 for first construction, with $20,000 annually for maintenance, is presented.

3. *Preliminary examination and survey of Elizabeth River, N. J., with a view to providing a channel of sufficient depth from the Broad Street Bridge to the channel in Staten Island Sound.*—Reports dated May 25. 1911, and March 16, 1912, are printed in House Document No. 750, Sixty-second Congress, second session. A plan of improvement, at an estimated cost of $15,443.50 for first construction, subject to certain specified conditions, is presented.

The local officer was also charged with the duty of making other preliminary examinations and surveys, provided for by the river and harbor acts approved June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. *Ship canal with depths of 30 and 35 feet extending from a point in the city of Newark below the junction of the Pennsylvania and Lehigh Valley Railroads through the Newark Meadows and Newark Bay to deep water of the Kill van Kull, N. J.*
2. *Raritan River, N. J.*, including a widening of the channel from the mill or Martins Creek to Martin's dock on the north side.
3. *Lemon Creek, N. Y.*
4. *New York Harbor, N. Y.*, with a view to securing increased width and depth of water from a point at or near Southwest Spit, northwest of Sandy Hook, N. J., through Lower New York Bay, Raritan Bay, and the channel between New Jersey and Staten Island, N. Y., to the channel in Upper New York Bay.

IMPROVEMENT OF RIVERS AND HARBORS IN THE PHILADELPHIA, PA., DISTRICT.

This district was in the charge of Maj. Herbert Deakyne, Corps of Engineers; Division Engineer, Col. William T. Rossell, Corps of Engineers.

1. *Delaware River, New York, New Jersey, and Pennsylvania, at or near the mouth of Neversink River.*—The channel of the Delaware River at its junction with the Neversink River at Port Jervis, N. Y., has an average depth of 5 to 6 feet at mean summer stage, and the width of the river varies from 500 to 800 feet. The channel at this point is available for rafting and logging operations only.

The Delaware River has its sources in Greene, Schoharie, and Delaware Counties, N. Y. It has a length of about 315 miles, flows in a general southerly direction, and empties into Delaware Bay. The length of the particular section included in this project is about 1.2 miles, and the distance of its lower end from the mouth of the river is about 255 miles. Between Port Jervis, N. Y., and Trenton, N. J., a distance of about 170 miles, the river is narrow and winding, with an average depth of from 2 to 3 feet at mean summer stage.

Previous to the adoption of the present project no work had been undertaken by the United States at this locality.

The existing project was adopted by the river and harbor act of June 25, 1910, and provides for the improvement of the Delaware River at or near the mouth of Neversink River by the removal of a ledge known as Sims Clip to a depth of 3 feet below "mean summer stage," the removal of a portion of Storms Island to "mean summer stage," the construction of a dike across the head of the Bendkill behind Storms Island, and another dike across the subsidiary channel which separates the two parts of Storms Island, in accordance with the report and maps printed in House Document No. 1164, Sixtieth Congress, second session.

The cost of removing Sims Clip to the required depth is estimated at $6,612.50, which work, under the project, is to be done by the United States. The estimated cost of the other work proposed is $54,780, which is to be borne by the States of New York, New Jersey, and Pennsylvania, or other local interests. The total estimated cost of the improvement is $61,392.50. The river and harbor act of June 25, 1910, appropriated $6,612.50 to be applied to the removal of Sims Clip, with the proviso that no part thereof is to be expended until the States named or other local interests shall have deposited in the Treasury of the United States to the credit of the Secretary of War the sum of $54,780, to be applied to that part of the improvement above indicated. No modification has been made in the existing project since its adoption.

The commerce on this section of the river is confined to the rafting of lumber, railroad ties, and building stone. A committee of citizens of Port Jervis, N. Y., under date of April 11, 1907, reported that the rafting commerce passing that point annually consisted of about 6,000,000 feet of lumber and, in addition, a considerable amount of structural stone and thousands of railroad ties, the approximate value of which was $100,000. It was also estimated that this amount of commerce would continue for many years to come. The main object of the proposed improvement is to furnish relief from the effects of floods due to ice gorges at Port Jervis. It is not probable that the proposed improvement will have any effect upon commerce or freight rates.

At the close of the fiscal year no action had been taken by the States named or other local interests toward supplying their share of the funds necessary to complete the proposed work. No work was done or liabilities incurred by the United States during the year, and it is not proposed to commence work until such time as the States named or other local interests supply their share of the necessary funds.

The distance from the head of tidewater at Trenton, N. J., to the sources of the river is about 230 miles, and the river is navigable for rafting and logging for a distance of about 214 miles above Trenton.

July 1, 1911, balance unexpended	$6, 612. 50
July 1, 1912, balance unexpended	6, 612. 50

(See appendix H 1.)

2. *Delaware River, New Jersey, from Lalor Street, Trenton, to upper railroad bridge.*—This is a new project. In its present condition, this section of the river varies in width from 1,000 to 1,500 feet, and is so obstructed by rocks and shoals as to be unfit for navigation for commercial purposes.

The Delaware River has its sources in Greene, Schoharie, and Delaware counties, New York. It has a length of about 315 miles, flows in a general southerly direction, and empties into Delaware Bay. The length of the particular section included in this project is about 1 mile, and the distance of its lower end from the mouth of the river is about 85 miles.

Previous to the adoption of the present project no work had been undertaken by the United States at this locality.

The existing project, adopted by the river and harbor act of July 25, 1912, provides for the construction by dredging of a channel 200 feet wide, and 12 feet deep at mean low water, with a turning basin at its upper end of the same depth 300 feet wide and 400 feet long, along the New Jersey side of the river from Lalor Street to the upper railroad bridge, Trenton, in accordance with the report published, with map, in House Document No. 839, Sixty-first Congress, second session, and subject to the conditions recommended by the Chief of Engineers on page 2 of said document. The work proposed will require the removal of about 426,000 cubic yards of coarse and heavy material, the estimated cost of which is $164,000. No modification has been made in the existing project since its adoption.

No work was done or expenditures made during the fiscal year 1912. Trenton is the actual and natural head of navigation for vessels and other craft. The river, however, is navigable for rafting and logging for a distance of about 214 miles above Trenton. Tide water extends as far as Trenton, and the mean range of tide at this point is 4.2 feet.

It is estimated that the sum of $114,000 can be profitably expended during the fiscal year 1914, in completing the improvement and making it available for purposes of commerce.

Amount appropriated by river and harbor act approved July 25, 1912	$50, 000. 00
Amount available for fiscal year ending June 30, 1913	50, 000. 00
Amount (estimated) required to be appropriated for completion of existing project	[1] 114, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 114, 000. 00

(See Appendix H 2.)

3. *Delaware River, from Allegheny Avenue, Philadelphia, Pa., to Trenton, N. J.*—In its original condition the channel was narrow and circuitous, of varying depth and width, and was available for com-

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[1] Exclusive of amount available for fiscal year 1913.

mercial purposes by steamers and other craft of shallow draft. At Fivemile Bar, between Allegheny Avenue and the Pennsylvania Railroad bridge, at Philadelphia, a shoal carrying from 3 to 4 feet at mean low water extended across the Pennsylvania side of the channel. There was, however, a depth of 13 feet past Fivemile Bar in the New Jersey side of the channel south of Petty Island. At Kinkora Bar, about 9 miles below Trenton, there was a shoal carrying 7½ feet at mean low water. From Bordentown to Trenton, a distance of about 5 miles, the depth of channel varied from 3 to 6 feet at mean low water.

The Delaware River has its sources in Greene, Schoharie, and Delaware Counties, N. Y. It flows in a general southerly direction and empties into Delaware Bay. The total length of the river is about 315 miles.

The section of the river included in this project is about 30 miles in length, and the distance of its lower end from the mouth of the river is about 55 miles.

Prior to 1910 no comprehensive project had ever been adopted for the improvement of this part of the river. Work had been done at various times since 1872 at different localities with a view to obtaining a depth of 7 feet at mean low water and a width of 200 feet. Under the general project for improving Philadelphia Harbor, a channel 26 feet deep was dredged through Fivemile Bar between 1888 and 1898.

The amount expended in the improvement of the Delaware River between Philadelphia and Trenton, prior to the adoption of the existing project and exclusive of the sum expended in the improvement of that part of Philadelphia Harbor north of Allegheny Avenue, was $197,623.25.

The existing project for the improvement of this section of the river was adopted June 25, 1910, and provides for a channel 200 feet wide and 12 feet deep at mean low water, at an estimated cost of $360,000 and an annual cost of $20,000 for maintenance, in accordance with the report printed, without maps, in House Document No. 702, Sixty-first Congress, second session. A map of this section of the river is published in the Annual Report of the Chief of Engineers for 1911, page 1350. No modification has been made in the existing project since its adoption.

The operations carried on under contract during the year have resulted in the removal of 472,527 cubic yards of dredged material, and the construction of 4,949 linear feet of single bulkhead dike. In addition, United States plant removed 62,334 cubic yards of dredged material. Operations during the year covered new work, no maintenance being done. Expenditures during the year amounted to $141,754.33.

The total amount expended on the existing project up to the close of the present fiscal year is $159,393.31, no part of which was applied to maintenance of improvement. The sum of $16.04 has been received from the sale of maps.

The work is being carried on under continuing-contract authorization, under which the balance remaining to be appropriated is $30,000.

About 60 per cent of the work under the approved project had been completed at the end of the fiscal year. The channel now has a least depth of 12 feet at mean low water and a width of 200 feet for a distance of about 27.7 miles. There remain about 2.3 miles of channelway to be dredged to the required width and depth, and about 1,800 linear feet of dike to be constructed to complete the work. The maximum draft that could be carried on June 30, 1912, over the shoalest part of the locality under improvement was about 7 feet at mean low water. The mean range of tide varies from 5.3 feet at Philadelphia to 4.2 feet at Trenton. The actual and natural head of navigation for steamers and other craft is at Trenton, N. J. The river is navigable above Trenton for rafting and logging for a distance of about 214 miles.

The work of improvement has not advanced sufficiently to cause any increase in commerce or to have any effect on freight rates.

It is estimated that the sum of $20,000 can be profitably expended during the fiscal year 1914 in the maintenance of the improvement.

July 1, 1911, balance unexpended	$242,377.06
June 30, 1912, amount expended during fiscal year, for works of improvement	141,754.33
July 1, 1912, balance unexpended	100,622.73
July 1, 1912, outstanding liabilities	991.77
July 1, 1912, balance available	99,630.96
Amount appropriated by sundry civil act approved August 24, 1912	70,000.00
Amount available for fiscal year ending June 30, 1913	169,630.96
July 1, 1912, amount covered by uncompleted contracts	144,202.40
Amount of continuing contract authorization, act of June 25, 1910	260,000.00
Amount appropriated under such authorization	230,000.00
Amount yet to be appropriated	30,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 30,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 20,000.00

(See Appendix H 3.)

4. *Delaware River, Pa., N. J., and Del., from Allegheny Avenue, Philadelphia, to the sea.*—In its original condition the width of the channel varied greatly at different points, and obstructions reduced its depth at mean low water to 17 feet at Mifflin Bar, 18 feet at Schooner Ledge and Cherry Island Flats, and about 20 feet at Bulkhead Bar, Baker Shoal, and Duck Creek Flats. It was available for ocean-going vessels of medium draft.

The Delaware River has its sources in Greene, Schoharie, and Delaware Counties, N. Y. It flows in a general southerly direction and empties into Delaware Bay. The total length of the river is about 315 miles. The distance by water from Philadelphia Harbor to the Harbor of Refuge, Delaware Bay, is about 101 miles.

The section included in this project is about 63 miles in length and extends into Delaware Bay for a distance of about 8 miles below the mouth of the river.

Prior to 1885 efforts to improve the river were confined to dredging, except at Schooner Ledge, where solid rock was removed. The work was done under appropriations for special localities and general appropriations for the Delaware River below Bridesburg.

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[1] Exclusive of amount available for fiscal year 1913.

The first permanent and systematic improvement of this section of the river was commenced in 1885, when a project was adopted for a channel 26 feet deep at mean low water, with a width of 600 feet, from a point about one-fourth mile above Allegheny Avenue, Philadelphia, to deep water in Delaware Bay.

A second project was adopted March 3, 1899. It provided for a channel 30 feet deep at mean low water, with a width of 600 feet, from Christian Street, Philadelphia, to deep water in Delaware Bay. The original work under this project was practically completed at the close of March, 1911.

A project for the improvement of Philadelphia Harbor, adopted August 11, 1888, was completed January 10, 1898, the resulting channel having a least depth of 26 feet at mean low water, except at one locality just below Cramp's shipyard, with a width varying from 1,015 to 1,850 feet extending from a point opposite Morris Street, Philadelphia, to the Pennsylvania Railroad bridge, a distance of 6.2 miles. In 1906 an allotment of $10,000 was made from the emergency appropriation contained in the river and harbor act of March 3, 1905, for redredging shoal places within the limits of this improvement. Final report on the completion of this project is printed in the Annual Report of the Chief of Engineers for 1899, page 1330, and an account of the work done under the emergency allotment in the report for 1907, page 1100. The total amount expended in this improvement, including survey of the locality and the acquisition of land, was $3.945,424.75.

The amount expended under all previous projects for improving the river below Philadelphia, from 1836 to the time of taking up the existing project, exclusive of the sum expended in the improvement of Philadelphia Harbor, was $10,176,002.08.

The existing project for the improvement of this section of the river, adopted June 25, 1910, provides for a channel 35 feet deep at mean low water, 800 feet wide in the straight parts, 1,200 feet wide at Bulkhead Bar, and 1,000 feet wide at the other bends, and for the construction of dikes to control the tidal flow, at an estimated cost of $10,920,000, and an annual cost of $300,000 for maintenance, in accordance with the report published, with maps, in House Document No. 733, Sixty-first Congress, second session. No modification has been made in the existing project since its adoption.

Operations covering new work carried on under contract during the year resulted in the removal by dredging of about 3,240,000 cubic yards of material and the placing of 40,234 tons of riprap material in dikes under construction. Maintenance work with the U. S. dredges *Delaware* and *Manhattan* was in progress throughout the year, resulting in the removal of about 9,801,000 cubic yards of dredged material, and an increase of 2 feet over the prevailing depth at the close of the fiscal year 1911. The amount disbursed during the year was $845,442.36, of which $519,904.33 was for new work, and $325,538.03 was for maintenance.

The total amount expended on the existing project up to the close of the present fiscal year was $1,082,001.96, of which $381,700.71 was applied to maintenance of the improvement. The sum of $805.87

was received during the year from sales of condemned property and contact print maps.

The work of dredging on Tinicum and New Castle Lighthouse ranges and dike construction in progress is being carried on under continuing-contract authorization, under which the balance remaining to be appropriated is $250,000.

The proportion of the approved project accomplished at the close of the fiscal year is about 6 per cent, and has resulted in securing an increase in width of from 200 to 600 feet and an increase in depth to 35 feet in certain sections under improvement, thereby greatly facilitating the movement of deep-draft vessels. The maximum draft that could be carried on June 30, 1912, over the shoalest part of this section of the river was 30 feet at mean low water. The mean range of tide varies from 5.3 feet at Philadelphia to 6 feet at deep water in Delaware Bay.

The gradual and systematic improvement of this section of the river and the increase in terminal facilities at the port of Philadelphia have led to the establishment during the year of three new steamship lines trading with foreign ports, and several of the old established lines have added larger and deeper draft boats to their fleet, while the number of deep-draft vessels having no regular port of call has increased. The owners of barges and canal boats trading on the river also report an increase in their fleets. The principal commodities of commerce carried on the river during the year consisted of coal, lumber, ores, iron and steel products, oils, sugar, grain, foodstuffs, and general merchandise. No change in the nature of the commerce has resulted from existing improvements. The following tabular statement shows the amount and value of commerce carried during the past 10 years:

Calendar years.	Short tons.	Value.	Calendar years.	Short tons.	Value.
1902	21,843,209	$1,621,239,450	1907	27,283,529	$1,588,886,889
1903	22,827,926	1,289,965,088	1908	24,023,895	1,249,175,518
1904	23,872,036	1,579,060,906	1909	24,677,671	1,327,869,862
1905	24,388,571	1,612,847,499	1910	25,496,218	1,340,891,894
1906	26,111,047	1,472,540,364	1911	25,786,180	1,209,879,741

The improvement has had no appreciable effect on foreign and coastwise freight rates, except that which is brought about through competition between larger and deeper draft vessels. The deeper draft vessels trading at this port are generally engaged in foreign commerce, and rates on the class of freight usually carried are largely regulated by supply and demand. Freight rates by regular steamship lines plying between points located on the section of the river under improvement average about 23 per cent lower than railroad rates between like points. Rates on freight carried by small craft on this section of the river average about 50 per cent of railroad rates. The owners of barges engaged in transshipping report a slight decrease in freight rates owing to the increased amount of commerce moved.

In recommending the adoption of the 35-foot project the Chief of Engineers pointed out the necessity for large appropriations to permit of a rapid prosecution of the work which, in view of the large cost of maintenance, is essential to secure the increased depth desired. For the year 1914 the appropriation should be not less than $2,500,000, of which approximately one-half should be in cash; but unless continuing-contract authorization be made, the appropriation should be not less than $2,000,000 in cash.

Of the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, it is proposed to apply $300,000 to maintenance of the existing channel, and the balance to new work of rock removal, dredging, and dike construction.

July 1, 1911, balance unexpended		[1]$1,102,967.54
June 30, 1912, credited to appropriation during fiscal year:		
Sales of blue prints	$21.92	
Sales of condemned property	783.95	
Transfer from allotment for Perriwig Bar	199.77	
		1,005.64
		1,103,973.18
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$519,904.33	
For maintenance of improvement	325,538.03	
		845,442.36
July 1, 1912, balance unexpended		258,530.82
July 1, 1912, outstanding liabilities		49,948.10
July 1, 1912, balance available		208,582.72
Amount appropriated by river and harbor act approved July 25, 1912		1,300,000.00
Amount appropriated by sundry civil act approved August 24, 1912		450,000.00
Amount available for fiscal year ending June 30, 1913		1,958,582.72
July 1, 1912, amount covered by uncompleted contracts		843,493.72
Amount of continuing-contract authorization, act of Feb. 27, 1911		700,000.00
Amount appropriated under such authorization		450,000.00
Amount yet to be appropriated		250,000.00
Amount (estimated) required to be appropriated for completion of existing project		[2]8,090,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[2][3]2,000,000.00

(See Appendix H 4.)

5. *Constructing pier in Delaware Bay, near Lewes, Del.*—The wooden-pile landing pier, constructed by the Government in 1837 at a cost of about $60,000, having fallen into decay, it was found necessary, after the completion of the old Delaware Breakwater harbor in 1869, to afford convenient means of communication with the shore for vessels using the harbor, and also to provide available means for the interchange of traffic and promotion of commerce.

The existing project providing for the construction of a good and substantial pier of stone or iron was adopted July 15, 1870. The work was commenced in 1871, and was completed in 1882, except as to superstructure, at a cost of $353,546.41, and resulted in the construction of 1,155 linear feet of pier 21 feet in width and 546 linear feet 42 feet in width, or a total length of 1,701 feet. At date of completion of the substructure the superstructure of the narrow part of the pier had been laid, in accordance with the original plan, but required complete rebuilding on account of decay. Between 1882 and June 30, 1890, the work was directed toward maintenance and practically carried to completion the superstructure of the pier. The depth of water at the pierhead was about 21 feet, and the mean range of tide is 4.5 feet. The pier is about 101 miles southeast of Philadelphia, Pa.

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[1] In the annual report for 1911, the unexpended balance on July 1, 1911, was given as $1,102,983.21. The difference between the 1911 balance and the balance above reported is $15.67, which amount was covered into the Treasury September 8, 1909, and heretofore carried as a part of the available balance.

[2] Exclusive of amount available for fiscal year 1913.

[3] Of this amount $250,000 is for continuing contract work authorized by the act of 1911.

References to examination or survey reports and maps or plans not in project documents.

Locality covered.	Annual reports of Chief of Engineers.	
	Year.	Page.
Delaware Bay near Lewes, Del.[1]	1871	667
Do.[1]	1872	75 and 758

[1] No maps.

No modification has been made in the existing project since its adoption.

The sum of $1,000 was appropriated by the river and harbor act of February 27, 1911, for maintenance of the improvement. This amount, together with an unexpended balance of $646.79, remaining from the appropriation of $1,500 made June 25, 1910, was expended during the year in replacing with new timber the decayed and broken fender piles, fender logs, chocks, and cap logs at and near the pierhead. The work was done with Government plant, using hired labor.

The total amount expended on the existing project up to the close of the present fiscal year was $387,839.40, of which $34,292.99 was for maintenance.

The right to use the pier for railway purposes, granted in the act of July 15, 1870, has never been and doubtless never will be exercised, as the pier has not sufficient strength to support the weight of modern freight engines. It is therefore impossible to obtain any assistance from the railroad company in maintaining and repairing the structure.

The pier is used to a considerable extent by the United States Lighthouse Establishment, quarantine service, and Engineer Department. It is of very great value to vessels frequenting the breakwater harbor in winter, when the harbor is packed with floating ice, rendering the anchorage dangerous. At such times vessels eagerly seek its shelter and protection.

No money will be required for the maintenance of this improvement during the fiscal year ending June 30, 1914.

July 1, 1911, balance unexpended	$1,646.79
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,646.79

(See Appendix H 5.)

6. Harbor of Refuge, Delaware Bay, Del.—The anchorage area provided by the old Delaware Breakwater, projected in 1828 and completed in 1869, was found to be too limited by reason of its low-water depth of about 16 feet, which prohibited its use by deep-draft vessels.

The harbor of refuge has a protected anchorage area of about 552 acres, with a minimum low-water depth of 30 feet, and an additional area of 237 acres with a minimum low-water depth of 24 feet. The harbor is located about 101 miles southeast of Philadelphia, Pa.

The present project, adopted June 3, 1896, provides for the creation of a national harbor of refuge suitable for deep-draft vessels by the construction of a breakwater located along the eastern branch of the shoal known as the "Shears," in accordance with the plans submitted by the Chief of Engineers January 29, 1892. The cost of the work was originally estimated at $4,665,000, which estimate was subsequently reduced to $2,350,000.

The project is based upon report printed in the annual report of the Chief of Engineers for 1892, page 941, and upon plans printed in House Executive Document No. 112, Fifty-second Congress, first session, but not published in the annual report of the Chief of Engineers.

No modification has been made in the existing project since its adoption.

Work on the breakwater was commenced May 4, 1897, and completed December 11, 1901. The substructure of the breakwater has a length of 8,040 feet and the superstructure a length of 7,950 feet, measured on the low-water line. The total quantity of stone deposited in the breakwater was 1,475,276 tons. Work on the 15 piers across the upper end of the harbor to protect it from moving ice descending the bay was commenced in October, 1900, and completed June 19, 1903, the work having been done under two subprojects, approved April 23, 1900, and June 30, 1902, providing for 10 and 5 ice piers, respectively. The amount of stone deposited in the ice piers was 108,973 tons.

Operations during the year consisted in an examination to ascertain the extent of repairs necessary to the ice piers. At the close of the year preparations were in progress for making repairs to the ice piers under the appropriation of $8,000, made by the river and harbor act of February 27, 1911, for maintenance of the improvement. The amount expended during the year was $52.62.

The cost of constructing the breakwater and the ice piers, including surveys, superintendence, and office expenses, was $2,238,205.34. Since the completion of the harbor the sum of $7,619.11 has been expended in maintenance work on the ice piers, making a total expended on the existing project up to the close of the present fiscal year of $2,245,824.45.

It is not expected that any money will be required for the maintenance of this improvement during the fiscal year ending June 30, 1914.

July 1, 1911, balance unexpended	$8,433.51
June 30, 1912, amount expended during the year, for maintenance of improvement	52.62
July 1, 1912, balance unexpended	8,380.89

(See Appendix H 6.)

7. ***Removing sunken vessels or craft obstructing or endangering navigation.*** (*a*) *Wreck of scow "Macyck."*—This scow, sunk in February, 1911, loaded with cordwood and lumber, was reported in August, 1911, as lying about halfway between Passyunk Avenue Bridge and Gibsons Point, on the westerly edge of the channel, Schuylkill River, and as endangering the safety of vessels navigating this stream. The wreck was removed by hired labor, work being completed August 21, 1911.

(*b*) *Wreck of coal barge.*—This barge, abandoned and beached several years ago by her owners in Frankford Creek, Pa., was reported in September, 1911, as having been washed downstream during an unusually high stage of water in the creek in 1911 and lodged in the draw of the bridge across the creek at Bridge Street, and as endangering the safety of barges navigating this stream. The wreck was removed by hired labor, work being completed on October 7, 1911.

(*c*) *Wreck of schooner "Eugene H. Cathrall."*—This schooner, sunk in 1911, loaded with king crabs, was reported in September, 1911, as lying about 1 mile east of Ship John Light, Delaware River, and as endangering the safety of vessels navigating the river at the entrance to Cohansey Creek, N. J. The wreck was removed by hired labor, work being completed November 15, 1911.

(*d*) *Wreck of lighter "Benedict."*—This lighter, sunk in 1911, loaded with ashes, was reported in October, 1911, as lying about 1,500 feet out from the pierhead line at Vine Street, Philadelphia Harbor, and as endangering the safety of vessels navigating this harbor. The wreck was removed by hired labor, work being completed on November 4, 1911.

(*e*) *Wreck of coal barge.*—This barge, sunk in 1911, was reported in April, 1912, as lying on course No. 2 of the Schuylkill River channel, about 320 feet north of the intersection of this course with the entrance course, and as endangering the safety of vessels navigating this stream. The wreck was removed by hired labor, work being completed May 1, 1912.

(*f*) *Wreck of barge "Belle Russell."*—This barge, sunk in 1912, was reported in April, 1912, as lying east of Petty Island and nearly opposite Cramer Hill Ferry, Philadelphia Harbor, and as endangering the safety of vessels navigating this harbor. Preparations for the removal of the wreck by contract are now in progress.

(*g*) *Wreck of barge "Estelle."*—This barge, sunk in 1912, loaded with sand, was reported in May, 1912, as lying about 40 feet west of the westerly edge of the main ship channel on Deep Water Point range, Delaware River, and as endangering the safety of vessels navigating this river. The wreck is now being removed by contract.

(*h*) *Wreck of barge "Tragic."*—This barge, sunk in 1912, loaded with oyster shells, was reported in June, 1912, as lying off the old waterworks wharf, Chester, Pa., westward of the main ship channel, Delaware River, and as endangering the safety of vessels using this part of the river. Preparations for the removal of the wreck by contract are now in progress.

The cost of the work on the wrecks removed during the year was $1,186.40.

(See Appendix H 7.)

EXAMINATION MADE IN COMPLIANCE WITH PROVISION OF RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Report dated November 5, 1910, on preliminary examination of *Delaware River, with a view to connecting the landing at Bordentown, N. J., with the main channel,* required by the river and harbor act approved June 25, 1910, was duly submitted by the district officer. It was reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and was transmitted to Congress and printed in House Document No. 262, Sixty-second Congress, second session. The improvement of this locality by the United States in the manner proposed is not deemed worthy of being undertaken at the present time.

The local officer was also charged with the duty of making other preliminary examinations and surveys, provided for in the river and harbor acts approved June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. *Frankford Creek, Pa.*
2. *Delaware River at Morrisville, Pa.*

IMPROVEMENT OF RIVER AND HARBORS IN THE WILMINGTON, DEL., DISTRICT.

This district was in charge of Maj. R. R. Raymond, Corps of Engineers. Division engineer, Col. William T. Rossell, Corps of Engineers.

1. *Cooper Creek, N. J.*—This creek enters the Delaware River in the city of Camden, just above Cooper Point. It was navigable at mean high water for a distance of 9 miles from its mouth for vessels drawing 5 feet, and for the first 5 miles for vessels of 11½ feet draft. For a distance of 1½ miles from the mouth the width of the stream averaged about 80 feet at low water and about 120 feet between the banks, and the channel in its original condition had a depth at mean high water of from 12 to 15 feet, except at one place where the depth was 9½ feet.

The project for this improvement was adopted in the river and harbor act of June 3, 1896, and is printed in House Executive Document No. 176, Fifty-third Congress, third session, and in the Annual Report of the Chief of Engineers for 1895, page 1102. It provides for the formation, by dredging, of a channel 70 feet wide on the bottom and 18 feet deep at mean high water (12 feet at mean low water) from the mouth of the creek to Browning's Chemical Works and a channel of the same dimensions through the bar just outside the mouth—in all, a distance of about 9,000 feet. The estimated cost, including contingencies, is $35,000.

The river and harbor act of June 3, 1896, appropriated $37,000 for completing this improvement, of which $2,500, or as much thereof as might be necessary, was to be expended in rebuilding the dike on the Government reservation in the Delaware River at Woodbury Creek.

The sum of $2,500 was expended in rebuilding the dike at Woodbury Creek referred to, and the channel in Cooper Creek was dredged in 1898 and 1899. This dredging resulted in the formation of a channel extending from the mouth to the Camden Iron Works, 7,500 feet long, 50 to 70 feet wide, except at the bridges, where the widths are 30 feet, and 18 feet deep at mean high water (12 feet at mean low water). At State Street the depth made was only 14 to 15 feet on account of a city water main crossing the stream at that depth. Further operations were suspended to await the lowering of this pipe, which was contemplated by the city.

In 1906, to meet the wants of the traffic in the creek, the channel was dredged between the State Street Bridge and the 12-foot contour in the Delaware River to a depth of 12 feet at mean low water and a width of 70 feet. The lowering of the pipe at State Street was completed in September, 1907.

With an allotment of $5,000 from appropriation of March 3, 1909, and the available balance of funds, the channel was dredged between December, 1909, and March, 1910, resulting in a continuous channel not less than 12 feet deep at mean low water from the 12-foot curve in the Delaware River upstream to within 160 feet of the upper boundary line of the Camden Iron Works, a distance of 8,635 feet, the width made being not less than 70 feet, except on a stretch of 600 feet from a point 400 feet below the State Street Bridge to 200 feet above that bridge, and a stretch of about 1,600 feet from a point just above the Federal Street Bridge, downstream, where a channel 12 feet deep and from 20 to 60 feet wide was found. On the stretch at the State Street Bridge, the full width of the draw, 49.5 feet, was found through the draw opening and its approaches.

Between December, 1911, and April, 1912, the channel was dredged from a point opposite the foot of Eleventh Street to a point about 900 feet above Federal Street Bridge to a depth of not less than 12 feet at mean low water and a bottom width of not less than 70 feet, except at the bridges, where the widths were made to conform to the draw openings.

About 70 per cent of the project work has been completed.

The amount expended on this improvement to June 30, 1912, is $51,628.74, exclusive of the $2,500 expended in rebuilding dike at Woodbury Creek. Of this amount $24,952.64 was for maintenance.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 12 feet from the Delaware River to the Camden Iron Works and 6¼ feet thence to Browning's Chemical Works. The stream is navigable nearly to the Medford Branch of the Pennsylvania Railroad, a distance of 9 miles, for boats drawing from 2 to 3 feet of water. The mean range of tide at the mouth is about 6 feet.

The commerce for the calendar year 1911 is reported to have been 267,244 tons, valued at $3,221,211.62.

The effect of the improvement made in this stream on freight rates has been to reduce them by permitting larger vessels to be secured for long voyages than was possible formerly. The railroad rates to points in the United States east of Cape Cod are 25 per cent higher than by water.

The river and harbor act of June 25, 1910, provides for an examination and survey of Cooper Creek with a view to an increased depth and an extension of the project. These have been made, but report on the survey is deferred pending action on proposed harbor lines.

A preliminary examination of this creek was made in 1892, and report thereon is printed in the Annual Report of the Chief of Engineers for 1893, page 1189, and in House Executive Document No. 81, Fifty-second Congress, second session.

It is proposed to expend the amount recommended below in dredging on the project and for maintenance.

July 1, 1911, balance unexpended	$13,054.44
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	12,183.18
July 1, 1912, balance unexpended	871.26
July 1, 1912, outstanding liabilities	100.00
July 1, 1912, balance available	771.26
Amount appropriated by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	5,771.26
Amount (estimated) required to be appropriated for completion of existing project	[1]1,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1]5,000.00

(See Appendix I 1.)

2. *Mantua Creek, N. J.*—Mantua Creek is a stream flowing into the Delaware River at a point about 10 miles below the terminal and ferry of the Pennsylvania Railroad at Camden, N. J.

In its original condition it was navigable at high water for a distance of one-half mile above its mouth to the phosphate works of the I. P. Thomas & Sons Co. for vessels of 13 feet draft; thence 3¼ miles farther, to Paulsboro, for vessels drawing 9 feet; thence 3¼ miles to Parkers Landing for tugs and barges drawing 6 feet, this being the head of steam navigation; thence 4.1 miles to Mantua, 11¼ miles above the mouth, small boats and barges of 3 to 4 feet draft passed up on the tide. The navigable portion is generally bordered by low ground, protected from overflow by earthen banks. The general course of the stream is tortuous, and its navigation was much obstructed by bars, sharp bends, and the upper portion by stumps and overhanging trees. The stream, on account of its flat watershed, is subject to only moderate freshets, which seldom exceed 2 to 3 feet above tide water. The low-water width near the mouth averaged 160 feet, decreasing to about 100 feet at Paulsboro. Above Paulsboro the width decreased to 88 feet at Parkers Landing, and near Mantua to 50 feet.

In 1889 a channel 8 feet deep at mean low water and from 60 to 70 feet wide was dredged, extending from deep water in the Delaware River to the phosphate works.

The approved project for the improvement, which was adopted by Congress in river and harbor act of March 3, 1899, is based upon a survey made in 1897 and printed in the Annual Report of the Chief of Engineers for 1898, page 1122, and in House Document No. 123, Fifty-fifth Congress, second session. It contemplates the dredging of a channel 100 feet wide on the bottom and 12 feet deep from the 12-foot contour in the Delaware River through the marsh to the phosphate works, a distance of 2,200 feet, thence 80 feet wide on the bottom and 8 feet deep, to Paulsboro, 6,300 feet, making a channel nearly direct by cutting off three bends; thence to Parkers Landing near Berkley, 3 miles, with one cut-off 60 feet wide and 7 feet deep;

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[1] Exclusive of amount available for fiscal year 1913.

and the dredging of a cut-off 350 feet long, 50 feet wide, and 3 feet deep, 9,000 feet above Berkley; also the removal of overhanging trees above Berkley and the construction of jetties on both sides at the mouth of the creek. The estimated cost of this improvement is $145,030. Such lands and rights as were considered necessary for the cut-offs were purchased in September, 1900, at a cost of $8,000.

Between 1901 and 1905 the channel between the phosphate works and Paulsboro was dredged to the project dimensions and the three cut-offs made as planned, and a channel 12 feet deep at mean low water dredged direct from the 12-foot contour in the Delaware River to the phosphate works, cutting off the old mouth, the width made being 110 feet across the flats and 100 feet at the upper and lower ends of the dredging.

For the protection of the channel at the mouth a jetty 754 feet in length was constructed in 1907, on the east side of the channel, and a jetty 579.5 feet on the west side, and a dike, 524 feet long, to close the old mouth of the river.

During the fiscal year 1909 the channel was dredged to a depth of 13 feet at mean low water and a width of 100 feet from the 12-foot curve in the Delaware River to the upper end of the I. P. Thomas & Sons' fertilizer works, thence 9 feet deep and 80 feet wide to the highway bridge at Paulsboro, and thence a distance of 12,000 feet 8 feet deep and 60 feet wide, these depths including 1 foot for overdepth allowed under the contract. The portion of this work below the Paulsboro highway bridge was maintenance work.

Under a contract made for the extension of the west jetty to fast land and the east jetty to a junction with the dike closing the old mouth and the reenforcement with sheet piling of the dike closing the old mouth, work was begun on May 24, 1912, and to the close of the fiscal year the dike closing the old mouth had been reenforced the entire length, 435 linear feet, and 74 piles driven in the east jetty; and under a contract for dredging work was begun also on May 24, 1912, and to the close of the fiscal year the channel had been dredged an aggregate length of about 750 feet below Parkers Landing to a width of 60 feet at bottom and 8 feet deep at mean low water, 1 foot having been allowed for overdepth made under the contract.

The amount expended on the improvement to June 30, 1912, is $98,998.57, of which $95,998.57 is on the present project. Of the latter amount $9,464.03 was for maintenance.

About 55 per cent of the project has been completed.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 12 feet from the Delaware River to the phosphate works, 7 feet thence to Paulsboro, 6 feet thence for a distance of 12,000 feet, and thence 2 feet to Mantua. The range of tide is 6 feet at the mouth, 4.5 feet at Paulsboro, 3.4 feet at Berkley, and 2 feet at Mantua, which is the head of navigation.

The commerce of the river, which is quite varied, is reported to have been 170,444 tons valued at $2,149,470 for the calendar year 1911.

It is proposed to expend the amount recommended below in dredging toward the completion of the project and in maintenance to keep the improvement available for navigation.

The river and harbor act of March 3, 1909, provided for an examination of Mantua Creek, with a view to continuing improvement to the head of navigation, and report thereon will be found in House Document No. 523, Sixty-first Congress, second session.

Reports on preliminary examinations are printed in Annual Report of Chief of Engineers for 1882, page 806 (S. Ex. Doc. No. 141, 47th Cong., 1st sess.), and in Annual Report of the Chief of Engineers for 1895, page 1088 (H. Ex. Doc. No. 66, 53d Cong., 3d sess.).

July 1, 1911, balance unexpended	$41,113.46
Transferred to miscellaneous receipts by Treasury Department, Aug. 31, 1911	200.00
	40,913.46
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,362.03
July 1, 1912, balance unexpended	39,551.43
July 1, 1912, outstanding liabilities	2,300.00
July 1, 1912, balance available	37,251.43
Amount appropriated by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	40,251.43
July 1, 1912, amount covered by uncompleted contracts	26,300.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 30,783.18
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 15,000.00

(See Appendix I 2.)

3. Raccoon Creek, N. J.—This creek rises in Gloucester County, flows in a northwesterly direction, and empties into the Delaware River at a point nearly opposite Marcus Hook, Pa.

It was originally navigable at high water for a distance of 1¾ miles above its mouth to Bridgeport for vessels of 9 feet draft, thence 3¼ miles farther to Springer's wharf for vessels drawing 7 feet, and thence 4¾ miles to Swedesboro, the head of steam navigation for boats and barges having a draft of 4 feet. Above Swedesboro the stream was narrow, shoal, and very crooked. The navigable portion, when it left fast land, wound through meadows lying 2 or 3 feet above low water, which, except for the 2 miles immediately below Swedesboro, were generally protected from overflow by revetted earthen banks. Navigation was much obstructed by bars and a few sharp bends.

A survey was made in 1883, report thereon being printed in the Annual Report of the Chief of Engineers for 1883, page 646, but no work of improvement was done thereon.

The approved project, adopted by the river and harbor act of June 13, 1902, is based upon a survey made in 1899, report on which is published in the Annual Report of the Chief of Engineers for 1900, page 1590, and in House Document No. 231, Fifty-sixth Congress, first session, and contemplates the formation of a dredged channel 7 feet deep and 75 feet in width at mean low water from the mouth for a distance of 1¾ miles to Bridgeport, thence a channel of the same depth and 60 feet wide to Springer's wharf, and thence a channel 5 feet deep at mean low water and 40 feet in width to the head of navigation at Swedesboro, 9¾ miles from its mouth, together with the widening of the channel around sharp bends, at an estimated cost of $102,135.

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[1] Exclusive of amount available for fiscal year 1913.

Between 1903 and 1906 a continuous channel was dredged to the project dimensions from the mouth to the highway bridge at Swedesboro, except widening at bends and the construction of the cut-off at Molonox Shoal.

The river and harbor act of March 2, 1907, appropriated $15,000 for continuing the improvement and for maintenance, and authorized a sufficient amount thereof to be applied to the making of a cut-off at Molonox Shoal, with proviso that no expenditure should be made thereon until the land needed therefor should have been deeded to the United States free of expense. This title was acquired in 1909.

For the expenditure of the $15,000 appropriated by the river and harbor act of March 2, 1907, which had been held to await title to land for the Molonox Shoal cut-off, a contract was made and under it dredging was done which resulted in a channel not less than 75 feet wide at bottom and not less than 7 feet deep at mean low water from the mouth to Bridgeport, not less than 60 feet wide and 7 feet deep from Bridgeport to Springers, and not less than 40 feet wide and 5 feet deep from Springers to Swedesboro, including the cut-off at Molonox Shoal, which latter saves about three-fourths of a mile of channel.

With the $12,500 appropriated by the river and harbor act of June 25, 1910, the channel was dredged at various points in 1911, resulting in a channel at least 7 feet deep at mean low water and 75 feet wide at bottom from the 7-foot contour in the Delaware River to the mouth; thence 7 feet deep with varying widths to Bridgeport; thence at least 60 feet wide and 7 feet deep to Springers; and thence at least 5 feet deep at mean low water and a bottom width of 40 feet to Swedesboro; a total distance of 8½ miles. The depths made included 1 foot overdepth allowed under the contract.

With the appropriation of $5,000 made by the river and harbor act of February 27, 1911, for maintenance, the channel was dredged from the fixed highway bridge at Swedesboro to the railroad bridge, the width made being not less than 40 feet at bottom and the depth not less than 7 feet at mean low water; and below the railroad bridge shoals were dredged to a depth of 7 feet to a point about 1¼ miles below or to the lower end of the first cut-off, the operations resulting in a channel not less than 40 feet wide at bottom and 5 feet deep at mean low water from the fixed highway bridge at Swedesboro to the lower end of the first cut-off, a distance of approximately 1¾ miles.

About 95 per cent of the project has been completed.

The amount expended on this improvement to June 30, 1912, is $64,283.49, of which $63,526.26 is on the present project. Of the latter amount $17,919.39 was for maintenance.

The maximum draft that could be carried on June 30, 1912, at mean low water, over the shoalest part of the locality under improvement, is 7 feet from the Delaware River to Springers and 5 feet thence to Swedesboro. The range of tide varies from 6 feet at the confluence with the Delaware River to 4.9 feet at Swedesboro, where it is considerably influenced by winds and freshets.

On account of the improvement of the stream, perishable freight is now expeditiously carried, and bulky freight by water costs only about half that by rail. The execution of the work has altered the stream by increasing the tidal range in the upper waters 1 foot, and, therefore, to effect the provisions of the project, it is necessary to do additional dredging to secure the low-water depth contemplated.

No complete statement of the commerce of the stream could be obtained. During the calendar year 1909 the commerce, as reported, was 58,107 short tons, valued at $719,750.

The project now contemplates a depth of 5 feet and a width of 40 feet between Springers and Swedesboro. This part of the project should be modified so as to permit the extension of the 7-foot channel to Swedesboro and the removal of a sharp bend above the railroad bridge at the latter place.

It is proposed to expend the funds asked for below in dredging in continuation of the improvement and for maintenance.

July 1, 1911, balance unexpended	$5,989.14
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	4,672.63
July 1, 1912, balance unexpended	1,316.51
Amount appropriated by river and harbor act approved July 25, 1912	4,000.00
Amount available for fiscal year ending June 30, 1913	5,316.51
Amount (estimated) required to be appropriated for completion of existing project	[1] 48,326.33
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 13,000.00

(See Appendix I 3.)

4. Oldmans Creek, N. J.—This creek is about 27 miles long and flows in a general northwesterly direction, forming throughout its entire length a portion of the boundary line between Gloucester and Salem Counties, N. J. It enters the Delaware River about 4½ miles below the mouth of Raccoon Creek and about 3 miles above Penns Grove, N. J. A fixed bridge at Auburn limits navigation to the stream below it. There are two large tributaries—Indian Run and Beaver Creek—about 4 miles and 6 miles, respectively, below Auburn.

Before the adoption of the present project the maximum low-water depth over the bar at the mouth was 2.8 feet, and the minimum low-water depth in the river was 5.4 feet from the mouth to Pedricktown and 3.9 feet thence to Auburn. The mean range of tide is 6 feet at the mouth, 2.4 feet at Pedricktown and .9 of a foot at Auburn.

Report of survey on which the present project is based is printed in House Document No. 1083, Sixtieth Congress, second session. The project was adopted by the river and harbor act of June 25, 1910, and provides for a new channel 100 feet wide and 6 feet deep across the bar at the mouth, with a jetty to maintain it; a channel 75 feet wide and 6 feet deep thence to Pedricktown, and a channel 40 feet wide and 5 feet deep thence to Auburn, with the necessary cut-offs and new mouth, at an estimated cost of $89,500.

The distance from the mouth to Pedricktown is about 6 miles and to Auburn, the head of navigation, about 15 miles.

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[1] Exclusive of amount available for fiscal year 1913.

The act making the appropriation provides that no part of the sum appropriated shall be expended until all land required for right of way for the necessary cut-offs shall have been deeded free of cost to the United States and the United States shall have been released from all claims for damages arising from the proposed diversion of the stream. Deeds for the land required and releases have been furnished and are now in the hands of the United States District Attorney for examination.

July 1, 1911, balance unexpended	$45,000.00
July 1, 1912, balance unexpended	45,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 44,500.00

(See Appendix I 4.)

5. *Salem River, N. J.*—In 1872 the upper part of this river was separated from the lower part by a dam and was connected with the Delaware River by a canal forming two independent streams with mouths about 10 miles apart.

Prior to the adoption of the present project $17,209.34 had been expended on improvement of this stream, of which $10,000 was applied to work in Salem Cove, at the natural mouth below Salem, with which a channel 8 feet deep and 100 feet wide at low water was obtained, and $7,209.34 to improvement of the upper river in the formation of a channel 6 feet deep and 50 feet wide at mean low water up to Hoxies Landing.

Report of survey on which the present project is based is printed in the Annual Report of the Chief of Engineers for 1897, page 1245, and report thereon by the Board of Engineers for Rivers and Harbors is printed in River and Harbor Committee Document No. 12, Fifty-ninth Congress, second session.

The existing project was adopted by the river and harbor act of March 2, 1907, which appropriated $29,000 for completion of the improvement. It provides for dredging the lower river below Salem 100 feet wide and 9 feet deep at mean low water, amplifying at the bends so as to permit the passage of vessels 200 feet long from Delaware River up to the highway bridge over Little Salem Creek, including the removal of the stony bars in front of the city wharves and at the bend above the brickyard. The estimated cost of this work, as given by the Board of Engineers for Rivers and Harbors in report of January 16, 1907, is $29,000, subsequently increased to $38,600.

After an examination of the channel proposals were invited, in July, 1907, for the required dredging, but as only one bid was received, at 27.5 cents per cubic yard, which was considered excessive, it was rejected. Proposals were again opened in May, 1908, under more favorable conditions, the lowest bid received this time being 19.9 cents per cubic yard.

In the examination above referred to it was found that the amount of material to be excavated to obtain the project channel dimensions, with an allowance of 1 foot for overdepth dredging, would be considerably in excess of that given in the report of survey of 1897, and upon recommendation of the Chief of Engineers, the Secretary of War, in accordance with section 2 of the river and harbor act of March 2, 1907, authorized the expenditure of the available funds to the excavation of a channel of such dimensions as could be secured thereby.

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[1] Exclusive of the balance unexpended July 1, 1912.

Accordingly a contract for dredging was entered into, and completed April 30, 1909. The channel was dredged to a depth of 10 feet, including 1 foot for overdepth made under the contract, and a width of 100 feet from the 9-foot curve in the Delaware River to the 9-foot depth in Salem River, a distance of 7,350 feet; and from the lower part of Little Salem River to the covered bridge, a stationary structure, a distance of 2,920 feet, the channel was dredged to a depth of 9 feet at mean low water and a width of 75 feet, resulting in a channel 9 feet deep at mean low water from the Delaware River to the covered bridge, the head of navigation at Salem, a distance of about 4½ miles, the width being 100 feet in the Delaware River to inside the mouth of Salem River, widening to 200 feet at the beacon, and thence 75 feet to Salem.

With the $5,000 allotted in January, 1910, from the appropriation of $8,185,750 provided by the river and harbor act of March 3, 1909, for preservation and maintenance of river and harbor works, to be applied to maintenance of Salem River, and part of the $10,000 appropriated by the act of June 25, 1910, the channel was dredged downstream for a length of 3,575 feet from a point about 1,000 feet below the covered bridge, resulting in a channel at least 9 feet deep between the points named, the widths varying between 50 and 100 feet.

The river and harbor act of February 27, 1911, appropriated $10,600 for completing the improvement and for maintenance, and with this the channel was dredged between March and May, 1912, at various points, including the removal of the stony bars in front of the city wharves, resulting in a channel at least 100 feet wide at bottom and at least 9 feet deep at mean low water from the mouth of the river to a point about 1,000 feet above the mouth of Little Salem River, a total distance of about 3¾ miles.

This completes the project with the exception of the stony bar at the bend above the brickyard.

The amount expended on this improvement to June 30, 1912, is $72,998.44, of which $55,789.10 is on the present project. Of the latter amount $17,189.10 is for maintenance.

The maximum draft that could be carried on June 30, 1912, at mean low water, over the shoalest part of the river under improvement was 9 feet to Salem. The range of the tide is 6 feet.

The commerce for the calendar year 1911, as reported, was 144,545 tons, valued at $10,973,960. It consists of canned goods, agricultural products, and general merchandise.

The effect of the improvement on freight rates has not been reported, but it is known that it has facilitated and expedited shipments of fruit and other perishable merchandise.

It is proposed to expend the amount recommended below in redredging the channel where necessary. In an examination made toward the close of the fiscal year it was found that the channel from the Delaware River to the mouth of Salem River had shoaled considerably, and that the cost of restoration would be $15,000 for a 9-foot depth and $10,000 for an 8-foot depth. The amount estimated below is for restoration to an 8-foot depth at the mouth and for redredging in the river.

Reports on preliminary examinations and surveys are printed in the Annual Report of the Chief of Engineers for 1879, page 474; 1882, page 814 (S. Ex. Doc. No. 141, 47th Cong., 1st sess.); Annual Report of the Chief of Engineers for 1885, page 860 (H. Ex. Doc. No. 71, 48th Cong., 2d sess.); Annual Report of the Chief of Engineers for 1895, page 1091 (H. Ex. Doc. No. 34, 53d Cong., 3d sess.).

Report on preliminary examination of Little Salem River is printed in the Annual Report of the Chief of Engineers for 1889, page 876.

July 1, 1911, balance unexpended		$12,649.42
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$4,356.64	
For maintenance of improvement	7,381.88	
		11,738.52
July 1, 1912, balance unexpended		910.90
July 1, 1912, outstanding liabilities		75.00
July 1, 1912, balance available		835.90
Amount appropriated by river and harbor act approved July 25, 1912		5,000.00
Amount available for fiscal year ending June 30, 1913		5,835.90
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 15,000.00

(See Appendix I 5.)

6. *Alloway Creek, N. J.*—This is a tidal tributary of the Delaware River, flowing westerly in the southwestern part of New Jersey, its mouth being about 50 miles below Camden, N. J. In its original condition the creek was obstructed between its mouth and Quinton, a distance of about 10 miles, by shoal areas in the upper half of the stream, which reduced the low-water depths to from 1.3 to 4 feet.

The project was adopted by the river and harbor act of September 19, 1890, and is based upon a survey made in 1889, report on which is printed in the Annual Report of the Chief of Engineers for 1890, page 906, and in House Executive Document No. 60, Fifty-first Congress, first session. It contemplates the formation by dredging of a channel 6 feet deep at mean low water and 60 feet wide from Quinton to a point about 1,000 feet above upper Hancock Bridge; thence a channel of the same depth and 75 feet wide to a locality known as the "Square," where the work was to be supplemented by a dike. At a locality known as the "Canal," in addition to a channel of the last-named dimensions, the width of the stream was to be increased to about 150 feet between its low-water lines. The project was modified on December 10, 1896, so as to provide for a dike formed by a single row of piles above upper Hancock Bridge. This modification did not increase the originally estimated cost of the work, which is $25,000.

Channels from 40 to 75 feet wide and 6 feet deep at mean low water have been dredged at various localities, and dikes 300 and 404 feet in length, respectively, have been constructed at the "Square" and above upper Hancock Bridge. The channel has been dredged not less than 75 feet wide and 6 feet deep from the mouth to a point one-half mile below Hancock Bridge, and thence 60 feet wide and 6 feet deep to the upper end of a shoal just above Hancock Bridge, a distance of 4.92 miles. This work extended to January, 1908.

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[1] Exclusive of amount available for fiscal year 1913.

The river and harbor act of March 2, 1907, appropriated $5,000 for continuing improvement and maintenance, and authorized a sufficient amount thereof to be applied to the construction of a cut-off at Fosters Bottle, with the proviso that no expenditure should be made thereon until all land needed for such cut-off should be deeded to the United States free of expense. This title was obtained, and under a contract the cut-off at Fosters Bottle was made, and resulted in a straight channel through it of a minimum depth of 7 feet at mean low water and a bottom width of at least 75 feet, 1 foot overdepth and side slopes having been allowed in accordance with the contract. This completed the project.

With $5,000 allotted from the appropriation for preservation and maintenance of river and harbor works, act of March 3, 1909, a contract was made for dredging, and under it the channel was dredged at various points in 1910 between the mouth and Quinton, the depth made being 6 feet at mean low water and the bottom widths 75 feet to upper Hancock Bridge and 60 feet thence to Quinton; and with funds provided by the river and harbor act of June 25, 1910, and February 27, 1911, the channel was redredged and the remains of 200 linear feet of fallen dike just above upper Hancock Bridge removed in 1911, resulting in a channel not less than 75 feet wide at bottom and not less than 6 feet deep at mean low water from the mouth to a point 1.000 feet above upper Hancock Bridge, and not less than 60 feet wide at bottom and 6 feet deep at mean low water thence to Quinton.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the stream under improvement was 5 feet to Quinton, the head of navigation. The mean range of tide is 6 feet at the mouth and 4 feet at Quinton.

The amount expended on this improvement to June 30, 1912, was $42,017.30, of which $20,619.57 was for maintenance.

The commerce for the calendar year 1911 is reported to have been 17,149 tons, valued at $482,950.

The freight rates are reported to have been lowered by reason of the improvement of the creek, but to what extent is not stated. Larger boats are enabled to enter and depart, and shipments have been facilitated very much by avoiding delays in waiting for tides.

It is proposed to expend the funds recommended below in dredging for maintenance to keep the channel available for navigation.

July 1, 1911, balance unexpended	$8,511.43
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	7,928.73
July 1, 1912, balance unexpended	582.70
Amount appropriated by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	3,582.70
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]5,000.00

(See Appendix I 6.)

7. *Cohansey River, N. J.*—In its original condition this river or creek was navigable to Bridgeton, 19 miles above the mouth, through a tortuous channel of ample depth. The obstructions to navigation were found at Bridgeton, where the city gas and water mains were

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[1] Exclusive of amount available for fiscal year 1913.

laid at a depth of only 4 feet below low water, and at the mouth, where the river discharged into Delaware Bay across a soft mud bar without any well-defined channel. At Bridgeton there is a fixed bridge known as the Nail Works Bridge, and just above the bridge is a milldam which limits the tidal basin of the stream.

Prior to adoption of the present project $36,000 had been expended in dredging a channel 7 feet deep at mean low water, 70 to 90 feet wide, to the Broad Street Bridge, 40 feet wide above to the Commerce Street Bridge, thence 4 feet deep to the Nail Works Bridge.

The present project is printed in House Document No. 645, Fifty-ninth Congress, first session, and was adopted in the river and harbor act of March 2, 1907, and is based on a survey made in 1905–6. It provides for dredging a cut 100 feet wide and 7 feet deep at mean low water at the mouth, and for dredging a channel to the same depth in the river from Stony Point to the Nail Works Bridge, the widths to be 100 feet to Broad Street Bridge, thence 75 feet to the Commerce Street Bridge, and thence 60 feet to the Nail Works Bridge, at an estimated cost of $55,800.

The gas and water mains obstructing the channel at Bridgeton having been removed, the channel was dredged between August, 1907, and February, 1908, from deep water at Stony Point to the nail works, the depth made being 8 feet at mean low water—which included 1 foot for overdepth allowed under the contract—100 feet wide to Broad Street, 75 feet wide thence to Commerce Street, and 60 feet wide thence to the Nail Works Bridge.

The title papers required by the river and harbor act of March 2, 1907, for the transfer of the land required for the necessary cut-offs, having been furnished and accepted by the Secretary of War in October, 1910, a contract was made for dredging, and under this, between September, 1911, and May, 1912, a new entrance to the mouth was cut through the marsh to the northwest of Cohansey Light, 100 feet wide at bottom and 9 feet deep at mean low water from the 7-foot depth in Cohansey River to the same depth in Delaware Bay; and the channel in the river was dredged from Stony Point to Broad Street Bridge to a bottom width of 100 feet, thence to Commerce Street to a width of 75 feet, and thence to the nail works to a width of 60 feet, the depth made being 8 feet at mean low water, resulting in a channel 9 feet deep at mean low water from Delaware Bay to the mouth and a continuous channel at least 7 feet deep at mean low water in the river to the nail works. This completed the improvement, except cutting off sharp bends in the river.

About 90 per cent of the project work has been completed.

The amount expended on this improvement to June 30, 1912, is $81,958.24, of which $45,958.24 is on the present project. Of the latter, $4,379.35 was for maintenance.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 7 feet from the Delaware River to the Nail Works Bridge. The range of tide is about 5½ feet at the mouth and at Bridgeton.

It has been impracticable to obtain complete commercial statistics. The receipts and shipments for the calendar year 1910 amounted to 107,390 tons, valued at $501,440.

The improvement was not sufficiently advanced in the season for it to show any marked effect upon freight rates.

Reports on surveys made in 1872 and 1881 are printed in the Annual Report of the Chief of Engineers for 1873, page 889, and for 1882, page 773 (S. Ex. Doc. No. 141, 47th Cong., 1st sess.).

No additional funds are required.

July 1, 1911, balance unexpended		$37,948.32
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$18,455.56	
For maintenance of improvement	3,551.00	
		22,006.56
July 1, 1912, balance unexpended		15,941.76
July 1, 1912, outstanding liabilities		150.00
July 1, 1912, balance available		15,791.76
Amount appropriated by river and harbor act approved July 25, 1912		5,000.00
Amount available for fiscal year ending June 30, 1913		20,791.76

(See Appendix I 7.)

8. *Maurice River, N. J.*—This is a new project, which was adopted by the river and harbor act of June 25, 1910. It is based upon a survey made in 1905, report upon which is printed in House Document No. 664, Fifty-ninth Congress, first session, and contemplates securing a channel depth of 7 feet at mean low water across the bar at the mouth of the river and in the river to the head of navigation at Millville, including a turning basin at the upper end, the width to be 100 feet to Millville Bridge and 60 feet wide thence to the milldam, at an estimated cost of $156,200.

This river has been under improvement since 1885, when operations were commenced under a project approved in 1882 providing for a channel 6 feet deep at mean low water through the 4 miles below Millville Bridge and 4 feet deep along the wharves of the city. A modification of the project, made in 1890, contemplated the 6-foot depth to the upper limits of the project, and one made in 1892 provided for extending this depth for a further distance of 500 feet with a width of 50 feet. This was completed in 1892 at a total cost of $43,000.

With the $25,000 appropriated by the river and harbor act of June 25, 1910, the channel was dredged in 1911 from Frenchs Bar upstream to the drawbridge at Millville to a bottom width of 100 feet and a depth of 8 feet at mean low water, which included 1 foot over depth made and allowed under the contract. Below Frenchs Bar there was a fairly good depth of water, except outside the mouth, where the depth was 5 feet at mean low tide.

About 15 per cent of the project work has been completed.

The amount expended on this improvement to June 30, 1912, is $65,790.77, of which $43,000 was on a previous project and $22,790.77 on the present project, no part of which was for maintenance.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the river under improvement to Millville was about 5 feet over the bar at the mouth and 7 feet in the river.

The average rise and fall of the tide is about 6 feet at the mouth and a little over 5 feet at Millville, the head of navigation. The distance to the mouth is 24 miles.

It was impracticable to obtain commercial statistics for the calendar year ending December 31, 1911.

It is proposed to expend the amount requested below in dredging in continuation of the project.

Reports on examinations and surveys are printed in the Annual Report of the Chief of Engineers for 1882, page 809 (S. Ex. Doc. 141, 47th Cong., 1st sess.), and in the Annual Report of the Chief of Engineers for 1900, page 1605 (H. Doc. No. 344, 56th Cong., 1st sess.).

July 1, 1911, balance unexpended	$24,353.94
June 30, 1912, amount expended during fiscal year, for works of improvement	22,144.71
July 1, 1912, balance unexpended	2,209.23
Amount appropriated by river and harbor act approved July 25, 1912	20,000.00
Amount available for fiscal year ending June 30, 1913	22,209.23
Amount (estimated) required to be appropriated for completion of existing project	[1] 111,200.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 30,000.00

(See Appendix I 8.)

9. Toms River, N. J.—This river is a tributary of Barnegat Bay on its western shore about 11 miles above Barnegat Inlet. The town of Toms River, the most considerable town on the river, is about 5 miles above its mouth. At the town of Toms River the stream has two forks. These were 50 to 75 feet wide. Before improvements were begun the controlling depth in the river was 5 feet at the entrance into Barnegat Bay, but above, from a point about two-thirds of a mile from the town, boats drawing over 2½ feet could not reach the public dock.

The present project, which is based upon a survey made in 1907, is printed in House Document No. 346, Sixtieth Congress, first session, and provides for dredging a channel 100 feet wide at bottom and 5 feet deep at mean low water from the highway bridge at the town of Toms River to the same depth in Barnegat Bay, at an estimated cost of $10,050 and $1,000 annually for maintenance.

The river and harbor act of June 25, 1910, appropriated $10,050 for the improvement, and with these funds the channel was dredged between April and August, 1911, upstream from the 5-foot depth in Barnegat Bay to the highway bridge at the town of Toms River, 5 feet deep at mean low water, the bottom width made being 100 feet to the junction, 40 to 50 feet on the north prong, and 40 to 80 feet on the south prong to the bridge. This completed the project.

The amount expended on the improvement to June 30, 1912, is $10,050.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the stream under improvement is 5 feet. The mean range of tide is about five-tenths of a foot.

There was little commerce during the calendar year 1911, as the channel improvement was not completed until about the middle of August.

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[1] Exclusive of amount available for fiscal year 1913.

It is proposed to apply the funds asked for below in redredging for maintenance.

July 1, 1911, balance unexpended	$6,787.20
June 30, 1912, amount expended during fiscal year, for works of improvement	6,787.20
Amount appropriated by river and harbor act approved July 25, 1912	1,000.00
Amount available for fiscal year ending June 30, 1913	1,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 1,000.00

(See Appendix I 9.)

10. Double Creek, N. J.—This is an arm of Barnegat Bay, entering it about 6 miles from Barnegat Inlet in a southwesterly direction. It extends to about 3 miles above the mouth. In its original condition the prevailing depth was about 1½ feet to the town of Barnegat, about 1 mile from the mouth, except for a short stretch in the entrance, where the depth was 6 feet. Over the crest of the sand bar at the mouth there was a depth of 1½ feet at mean low water.

The present project is based upon a survey made in 1909, report upon which is printed in House Document No. 646, Sixty-first Congress, second session. It provides for dredging a channel 40 feet wide and 5 feet deep at mean low water from the highway bridge at Barnegat to the 5-foot contour in Barnegat Bay, including the cutting off of the narrow strip of land which forms Shad Point and the construction of a fence or dike 550 feet long extending out from Hollingsworths Point, at an estimated cost of $7,800. This amount was appropriated by the river and harbor act of June 25, 1910, with the proviso that no part of the appropriation should be available for expenditure until the township of Union, Ocean County, N. J., should have accepted the authority of the State of New Jersey to maintain the improvement and made provision for maintenance in such manner and form as should be satisfactory to the Secretary of War; and with the further proviso that all rights of way necessary for the improvement should be furnished free of cost to the United States.

These requirements having been fulfilled, contracts were made for the work, and under them the channel was dredged from the 5-foot curve in Barnegat Bay to the highway bridge at Barnegat, the head of navigation, the width made being 40 feet at bottom and the depth 6 feet at mean low water, which included 1 foot overdepth made and allowed under the contract, this including the cut-off at Shad Point; and the fence or dike was constructed at Hollingsworth Point, the length being 501½ feet. The work was begun in November, 1911, and completed in March, 1912. This completed the project.

The amount expended on the improvement to June 30, 1912, is $7,800, no part of which was for maintenance.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 6 feet. The range of tide is about 0.55 of a foot.

The commerce reported for the calendar year 1911 is 26,280 tons, valued at $459,664.

The effect of the improvement on freight rates has not yet been ascertained.

No additional funds are required.

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[1] Exclusive of amount available for fiscal year 1913.

July 1, 1911, balance unexpended	$7,800
June 30, 1912, amount expended during fiscal year, for works of improvement	7,800

(See Appendix I 10.)

11. Tuckerton Creek, N. J.—This is a tidal stream flowing into Little Egg Harbor, on the Atlantic coast, northeast of Atlantic City.

The original low-water depth at Tuckerton, the head of navigation, was 15 inches, which increased gradually to 4 feet at the mouth of the creek, a distance of 2 miles. From the mouth of the creek across the flats to Gaunts Point, seven-eighths of a mile, the low-water depths were 2 to 2½ feet.

In 1896 a preliminary examination was made of the stream, the report on which is printed in House Document No. 123, Fifty-fourth Congress, second session, and in the Annual Report of the Chief of Engineers for 1897, page 1230.

The survey upon which the present project is based is printed in House Document No. 274, Fifty-sixth Congress, first session, and in the Annual Report of the Chief of Engineers for 1900, page 1612.

The project was adopted by the river and harbor act of June 13, 1902, and contemplated the dredging of a channel 6 feet deep at mean low water and 80 feet wide from Gaunts Point, seven-eighths of a mile, to the mouth of the creek; thence a channel of the same depth and 75 feet wide, 1 mile, to Parkers Landing; thence a channel of the same depth and 60 feet wide, five-eighths of a mile farther, to West Tuckerton Landing; thence a channel 5 feet deep at mean low water and 60 feet wide for three-eighths of a mile to just above Scow Landing, and thence a channel 3 feet deep at mean low water and 40 feet wide for one-eighth of a mile to the milldam at Tuckerton, together with the widening of the channel at sharp bends; the channel across the cove between the mouth of the creek and Oyster Bed Point to be supplemented, if necessary, by a revetment wall along its northern side. The estimated cost of the work, including contingencies, is $61,380. To the end of the fiscal year 1904 the channel had been dredged to the project widths from the mouth of the river to a point 2,100 feet below the milldam at Tuckerton, the depth made being 6 feet at mean low water, except the upper 581 feet, which was dredged to 5 feet at mean low water. Under authority contained in the river and harbor act of March 3, 1905, the Secretary of War authorized the location of the channel at the mouth to be changed so as to lead it in a south-southeast direction, directly to the deep water at the head of Marchelder Channel instead of to Gaunts Point.

The river and harbor act of March 2, 1907, appropriated $12,000 for continuing the improvement, and a project for the expenditure of the appropriation was duly approved by the Chief of Engineers. This included dredging of the cut from the mouth of Tuckerton Creek to the Marchelder Channel. It was then found, however, that dredging along that line would destroy several oyster beds held and owned by private parties under leases from the State of New Jersey, and it was therefore concluded to defer operations until this matter could be adjusted.

Under date of December 16, 1907, the chief of the bureau of shell fisheries of the State of New Jersey advised this department that all objection to the proposed dredging had been removed, and thereupon contract for the dredging was entered into. The contract provided for dredging a straight channel from deep water of Marchelder Channel, off Parkers Island, across the flats of Little Egg Harbor to the mouth of Tuckerton Creek, passing through the point on the southwest side of the mouth, and then dredging, as far as the available funds would permit, the upper river, the depths to be 5 feet at mean low water from Marchelder Channel to Scow Landing, and thence 3 feet to the milldam.

The contractor's plant arrived at the lower end of Marchelder Channel on June 19, 1908, and to the end of July only 1,048 cubic yards of material had been dredged, and no work was done thereafter. On September 10, 1908, the contract was annulled. New proposals for the dredging were opened October 30, 1908, but as the prices bid were excessive the bids were rejected.

The river and harbor act of March 3, 1909, provided $2,000 for maintenance of this improvement, and proposals were then invited for dredging with the entire amount available, but no bid was received. Proposals were again invited upon revised specifications and opened July 8, 1909, and contract made, and between April and October, 1910, the channel was dredged from the head of Marchelder Channel toward the mouth of Tuckerton Creek for a length of 4,100 feet, the depth made being 6 feet at mean low water, and in the river the channel was dredged from Crozier's railway upstream a length of about 1,900 feet to the head of navigation, the depth made ranging from 5 to 3 feet, the width being 40 feet.

The river and harbor act of June 25, 1910, appropriated $12,000, and in 1910–11 the channel was dredged from a point 4,100 feet northwest of Parkers Island, for a distance of 5,290 feet, continuing across Little Egg Harbor, through the point at the mouth of the creek, and up the creek for a distance of 400 feet. The width was made 80 feet at bottom and the depth 7 feet at mean low water, which included 1 foot overdepth made and allowed under the contract

With the appropriation made by the river and harbor act of February 27, 1911, the channel was dredged at various points in the river from the milldam at Tuckerton down, an aggregate length of 9,880 feet, and the old mouth was closed.

The operations resulted in a channel 7 feet deep at mean low water from the mouth of the creek to West Tuckerton, approximately 70 feet wide at bottom for a length of 1,650 feet upstream from the mouth, thence 75 feet wide to Parkers Landing, and thence 60 feet wide to West Tuckerton; and from West Tuckerton the depth was made 6 feet with a width of 60 feet to Willow Landing, and thence to the milldam the depth was made 5 feet, with a turning basin 150 feet wide at the milldam. The depth included 1 foot overdepth made and allowed under the contract.

The amount expended on this improvement to June 30, 1912, is $64,648.63, of which $9,510.90 was for maintenance.

About 97 per cent of the project has been completed.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 6 feet across Little Egg Harbor, and up the creek to West

Tuckerton, and thence 5 feet to the milldam. The mean range of tide is 2½ feet.

The commerce for the calendar year 1911 is reported to have been 13,975 tons, valued at $799,600.

The effect of the improvement on freight rates has not been reported.

July 1, 1911, balance unexpended		$29,489.28
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$16,757.91	
For maintenance of improvement	4,000.00	
		20,757.91
July 1, 1912, balance unexpended		8,731.37
July 1, 1912, outstanding liabilities		6,250.00
July 1, 1812, balance available		2,481.37
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 5,000.00

(See Appendix I 11.)

12. Absecon Inlet, N. J.—This is a new project for which provision is made in the river and harbor act of July 25, 1912, as follows:

> Improving Absecon Inlet, N. J., in accordance with the report submitted in House Document No. 1395, Sixty-first Congress, third session, $190,000, of which amount so much as may be necessary may be used for the construction of a dredge: *Provided*, That if, in the opinion of the Secretary of War, dredges of a suitable character to do the work at Absecon Inlet are readily obtainable for doing the work by contract at reasonable rates, the amount herein appropriated shall become immediately available for the prosecution of such work.

Absecon Inlet is located just north of Atlantic City and south of Brigantine Beach, N. J. The channel proper is about 1,200 feet wide, and the ruling depth is between 7 and 9 feet at mean low tide. The mean range of tide is about 4 feet.

The project for improvement is based on a plan and estimate submitted by a board of engineers and provides for a channel 12 feet deep at mean low water and 300 feet wide, to be increased ultimately to 600 feet, by means of dredging, at an estimated cost, for plant and preliminaries, of $190,000, with $45,000 annually for operation of the dredging plant, the report recommending the purchase of a dredge and its operation by the Government.

It is proposed to expend the funds recommended below in prosecuting the improvement.

Amount appropriated by river and harbor act approved July 25, 1912	$190,000.00
Amount available for fiscal year ending June 30, 1913	190,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[2] 45,000.00

(See Appendix I 12.)

13. Absecon Creek, N. J.—This is a new project, for which provision is made in the river and harbor act of July 25, 1912, in accordance with the report printed in House Document No. 71, Sixty-second Congress, first session.

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[1] Exclusive of the balance unexpended July 1, 1912.

[2] Exclusive of amount available for fiscal year 1913.

Absecon Creek is a tidal stream on the eastern shore of New Jersey and empties into Absecon Bay about 5 miles northwest of Atlantic City. The creek is about 3 miles long, 80 to 100 feet wide, and had when last examined a prevailing depth of from 10 to 15 feet, except just below the highway bridge, where there is an obstruction, presumably the ruins of a draw. The range of tide is about 4 feet.

The project is based on a survey made in 1910, and provides for a channel 5 feet deep at mean low water and 50 feet wide from Absecon to the mouth of the creek, thence 80 feet wide across Absecon Bay to the head of Absecon Bay Channel, including a turning basin at Absecon, at an estimated cost of $15,000, with $1,600 annually for maintenance after completion.

It is proposed to expend the funds recommended below in dredging for maintenance of the improvement.

Amount appropriated by river and harbor act approved July 25, 1912	$15,000.00
Amount available for fiscal year ending June 30, 1913	15,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 1,600.00

(See Appendix I 13.)

14. Cold Spring Inlet, N. J.—The locality is on the coast of New Jersey, about 3 miles east of the city of Cape May. Within the inlet there was originally a natural basin about 6 feet deep and 60 acres in area. In the throat of the inlet the depth was 29 feet at mean low water and on the outside bar there was a minimum depth of 3.5 feet at low water about one-half mile out. There was no commerce.

Improvement of the locality was begun by private parties to enlarge the basin inside the inlet to about 500 acres in area, with a depth of 30 to 40 feet; and to complete the plan for a safe landlocked harbor for commerce and refuge the General Government has undertaken to provide a suitable connection between it and the deep water in the ocean, so as to make the harbor accessible to seagoing vessels.

The plan of improvement adopted by the river and harbor act of March 2, 1907, is based on a survey, report upon which is printed in House Document No. 388, Fifty-ninth Congress, second session, and contemplates providing an entrance channel 25 feet deep at mean low water by construction of parallel stone jetties 750 feet or over apart and dredging between them, at an estimated cost of $1,311,000. The adoption of this project was conditional upon the contribution of $100,000 toward the improvement by local authorities or private parties. This contribution was made by deposit on February 28, 1908, with the assistant treasurer of the United States at Philadelphia, Pa., of $100,000 to the credit of Maj. C. A. F. Flagler, Corps of Engineers, the then district engineer officer, by the Cape May Real Estate Co.

All the requirements of the act of 1907 relative to conveyance of land, etc., have been carried out and the deeds of conveyance to the United States approved by the Department of Justice.

Under subproject approved by the Chief of Engineers May 13, 1907, the stone jetties were made parallel throughout their whole length, and the clear distance apart fixed at 850 feet, with wings at shore ends of pile, brush, and stone construction.

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[1] Exclusive of amount available for fiscal year 1913.

By authority of the Chief of Engineers, August 30, 1907, this project was modified by the substitution of pile, brush, and stone construction in place of stone for a length of 2,000 feet on the inshore end of the west jetty, as borings showed an underlying stratum of mud of considerable depth.

The dredging of the inner harbor by the Cape May Real Estate Co. was a little more than one-half completed when work was suspended in 1908. By an instrument dated December 9, 1908, supplemental to an agreement executed June 25, 1907, the time for the completion of the inner harbor was extended to September 30, 1910; by a similar instrument dated January 23, 1911, the time for completion was extended to September 11, 1911; and by a similar instrument dated October 1, 1911, the time for completion was extended to September 30, 1914. Dredging of the harbor was resumed January 11, 1912, and was still in progress at the end of the fiscal year. A bulkhead along the westerly harbor line from the angle of the west jetty and wing was also under construction.

The report of survey upon which the plan of improvement by the Government is based is printed in House Document No. 388, Fifty-ninth Congress, second session.

On October 3, 1907, proposals were opened for the required jetty work and award made to the lowest bidder, the Seacoast Construction Co., of New York. This company, however, failed to execute the contract required, and later, upon evidence that it had been merged into the Breakwater Construction & Engineering Co., a contract, dated January 18, 1908, was entered into with that company on the bid submitted by the Seacoast Construction Co., the work to be commenced within 60 days and completed within two years and two months after notification of approval of the contract, which was received by the company on April 20, 1908.

Work under the contract was begun at the site on July 29, 1908, by the Breakwater Co., the legal assignee and succesor of the Breakwater Construction & Engineering Co.

During the fiscal year about 10,333.75 short tons of stone was deposited in the east and west jetties, making a total of 326,049.38 short tons, completing the jetties. The estimate upon which the contract was based was for an approximate amount of 285,000 short tons. This amount has been exceeded on account of scour and settlement of the slopes of the jetties, and by scour over the shoal portion of the east jetty, requiring stone to be deposited in deeper water than was shown on survey upon which approximate estimate was based. About 255.70 short tons of riprap stone was furnished and deposited along the channel side of the pile, brush, and stone portion of the west jetty, and about 3,710.69 short tons in six groins, 42 to 45 feet in length from the channel slope of the west jetty, from station 2400 to 3640, to deflect the ebb current away from the jetty, making a total of about 12,192.17 short tons of riprap stone. All work under the contract was completed August 12, 1911.

Under date of December 15, 1911, the Secretary of War authorized the immediate dredging of a channel between the jetties 400 feet in width and 15 feet in depth at mean low water, and subproject for the work was approved January 28, 1912. Proposals for dredging were opened March 8, and contract dated March 18 and approved March 22, 1912, was made with the American Dredging Co., the work to be commenced within 30 days after notification of approval of the contract, which was given March 28, 1912, a 100-foot channel to be completed within 3 months after said notification, and the 400-foot channel within 10 months after said notification. Work under the contract was begun May 23, 1912, and at the close of the fiscal year about 144,744 cubic yards of material, place measurement, had been dredged from the 100-foot channel on the easterly side of the 400-foot channel and deposited back of the pile, brush, and stone portion of the west jetty.

The work is being done under continuing contracts for completion, $249,800 remaining to be appropriated.

The amount expended on this improvement to June 30, 1912, is $798,888.56, of which $77,158 was from funds contributed by the Cape May Real Estate Co.

The present channel over the bar is about 150 feet wide close along the west jetty, with a least depth of 8 feet at mean low water. The range of tide is 4½ feet. The proportion of the approved subproject for dredging accomplished up to June 30, 1912, is about 17 per cent, not sufficient to have any effect upon the channel over the bar.

No funds, in addition to those on hand, are needed for the fiscal year ending June 30, 1914.

July 1, 1911, balance unexpended	$331, 524. 24
June 30, 1912, amount expended during fiscal year, for works of improvement	69, 212. 80
July 1, 1912, balance unexpended	262, 311. 44
July 1, 1912, outstanding liabilities	7, 350. 00
July 1, 1912, balance available	254, 961. 44
July 1, 1912, amount covered by uncompleted contracts	60, 000. 00
Amount of continuing contract authorization, act of Mar. 2, 1907	900, 000. 00
Amount appropriated under such authorization	650, 200. 00
Amount yet to be appropriated	249, 800. 00
Amount (estimated) required to be appropriated for completion of existing project	[1] 249, 800. 00

(See Appendix I 14.)

15. Wilmington Harbor, Del.—The harbor of Wilmington, Del., is in the Christiana River and includes a length of about 4 miles above its mouth at the Delaware River. It also includes the navigable portion of the Brandywine River (2 miles), which flows into the Christiana River at a point about 1¾ miles above its mouth.

Previous to 1836, when the first appropriation for the improvement of the Christiana River was made, the low-water depth at the entrance to this stream was about 8½ feet. The minimum depth in the channel in the portion of the river below Third Street Bridge, Wilmington, was 8 feet. This depth was increased in 1836 by dredging to 10 feet below low water, and under projects of 1871 and 1881 to 12 and 15 feet, respectively.

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[1] Exclusive of the balance unexpended July 1, 1912.

Report upon a survey made in 1880 is printed in Annual Report of the Chief of Engineers for 1881, page 771, and in House Executive Document No. 34, Forty-sixth Congress, third session.

The present project is based upon a survey made in 1895 and adopted in river and harbor act of June 3, 1896, report on which is printed in the Annual Report of the Chief of Engineers for 1896, page 973, and in House Document No. 66, Fifty-fourth Congress, first session. It provides for the formation, by dredging, rock removal, and construction of dikes, of a channel in the Christiana River 21 feet deep at mean low water from that depth in the Delaware River to the pulp works, a distance of about 4 miles, and thence diminishing to a depth of 10 feet at mean low water to the draw pier of the Philadelphia, Baltimore & Washington Railroad cut-off bridge No. 4, the width at the bottom varying between 250 feet at the mouth and 200 feet at bridge No. 4. The project further provides for the removal of shoals from bridge No. 4 to Newport to a depth of 7 feet at mean low water. This project was completed in 1906. The depth made over the rock ledges just above and below the Third Street Bridge is about 21½ feet.

Further work contemplated is for maintenance of the improvement.

With $40,000 allotted in 1909 from the appropriation made by the river and harbor act of March 3, 1909, the channel was dredged at several points up to the lower end of the Harlan & Hollingsworth Corporation's dry dock, 18 feet deep at mean low water to the Third Street Bridge and 17 feet above; and in the lower river from the inner end of the jetty at the mouth upstream, a length of about 2,250 feet, a length of 1,560 feet near the cut-off bridge No. 3, and from abreast of the McCullough Iron Co. to the Market Street Bridge, a distance of about 4,700 feet, the width and depth made being respectively 150 feet and 19 feet, resulting in a channel 19 feet deep at mean low water and 150 feet wide from the entrance at the mouth of the Christiana River to the Market Street Bridge. Outside of the entrance there was a minimum depth of 17½ feet to that depth in the Delaware River.

The river and harbor act of June 25, 1910, appropriated $100,000 for maintenance of the improvement, and with this appropriation the channel was dredged between March, 1911, and March, 1912, to a depth of 18 feet at mean low water from the 17-foot depth in the Delaware River to the Baltimore & Ohio Railroad bridge, a length of about 4½ miles, the widths made being 250 feet to the mouth of the Brandywine and 200 feet thence to the Baltimore & Ohio Railroad bridge; thence to a depth of 13 feet to the upper end of the pulp-works wharf, a distance of 2,500 feet, and thence decreasing to 10 feet deep at bridge No. 4, Shellpot cut-off branch of the Philadelphia, Baltimore & Washington Railroad, the width made to this point being 200 feet, and thence 7 feet deep and 100 feet wide to Newport.

The amount expended on this improvement from 1836 to June 30, 1912, is $1,107,985.46, which includes $500.69 expended from appropriation for emergencies in removal of obstructions from the channel above Churchman's bridge. Of this amount $705,363.56 was expended on the present project, and of which amount $261,711.93 was for maintenance.

At the close of the fiscal year the condition of the channel was as follows:

From the Delaware River to the outer end of the jetty, 16 feet deep at mean low water for a width of 250 feet; thence 18 feet deep for a width of 150 feet to the Third Street Bridge; thence 18 feet deep for a width of 100 feet to Pusey & Jones's marine railway; thence 14 feet deep for a width of 150 feet to the upper end of Pusey & Jones's shipyard; thence 18 feet deep for a width of 150 feet to the Baltimore & Ohio Railroad bridge; thence 13 feet for a width of 200 feet to the upper end of the pulp-works wharf; thence 11 feet for a width of 200 feet to cut-off bridge No. 4, and thence 100 feet wide and 7 feet deep to Newport. The maximum draft that could be carried on June 30, 1912, over the shoalest part of the river under improvement was 14 feet to the pulp works and 7 feet thence to Newport.

The range of tide is slightly over 6 feet at the mouth and about 3.6 feet at Christiana village. The stream is navigable to about a quarter of a mile above the village of Christiana, or 15½ miles above the mouth.

The river and harbor act of March 3, 1909, called for an examination of the Christiana River from Newport to Christiana, and a report thereon is printed in House Document No. 399, Sixty-first Congress, second session.

The tonnage of the leading articles shipped to and from Wilmington during the calendar year 1911 is reported to have been 859,736 short tons valued at $68,674,051.

The shipbuilding industry on the river is quite extensive, the records of the Department of Commerce and Labor showing that, with the exception of Philadelphia and Newport News, Wilmington had the largest steel shipbuilding output on the Atlantic coast for the 10 years ending June 30, 1905.

The harbor improvements do not directly affect freight rates on light-draft boats to any large extent. Shipments thereon made by water range about 25 per cent lower in rate than by rail, but much more in deep draft vessels, of which there are many, covering shipments to and from the manufacturers and shipbuilding plants.

A contract has been made for dredging with the appropriation made by the river and harbor act of February 27, 1911, and the contractor is now engaged in building banks to retain the dredged material.

The river and harbor act of February 27, 1911, made an appropriation of $100,000, and provided that a reexamination of the harbor be made with a view to determining a method by which an improvement adequate for the needs of commerce can be maintained at less cost. A board of officers has reported upon the matter, and its report thereon has been submitted to Congress and printed in House Document No. 359, Sixty-second Congress, second session.

The plan recommended was the purchase of a self-contained hydraulic dredge with auxiliaries, including a wharf, at an estimated cost of $250,000, with $30,000 annually for its operation. This plan was adopted by the river and harbor act approved July 25, 1912, which made an appropriation of $250,000 for purchase or construction of the dredging plant; and also provided that if, in the opinion of the Secretary of War, dredges of suitable character to do the work proposed are readily available for doing the work by contract at reasonable rates, the amount appropriated shall become immediately available for the prosecution of such work. An estimate of $30,000 for the fiscal year 1914 is therefore submitted for prosecution of the work.

July 1, 1911, balance unexpended	$198,396.09
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	61,985.79
July 1, 1912, balance unexpended	136,410.30
July 1, 1912, outstanding liabilities	8,250.00
July 1, 1912, balance available	128,160.30
Amount appropriated by river and harbor act approved July 25, 1912	250,000.00
Amount available for fiscal year ending June 30, 1913	378,160.30
July 1, 1912, amount covered by uncompleted contracts	100,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 30,000.00

(See Appendix I 15.)

16. Appoquinimink, Murderkill, and Mispillion Rivers, Del.—(*a*) *Appoquinimink River.*—At the time of the adoption of the present project there was a mean low-water depth of 2 feet at the entrance into Delaware Bay, and the shoalest depth inside the river was 4½ feet. The most serious obstructions to the navigation of the river were the many bends in the lower and middle sections.

The approved project is based upon a survey made in 1889, report on which is printed in the Annual Report of the Chief of Engineers for 1890, page 943, and in House Executive Document No. 19, Fifty-first Congress, first session. This project was adopted by Congress in river and harbor act of September 19, 1890, and provides for a channel 8 feet deep at mean low water, having a width of 80 feet from the bridge at Odessa, the head of navigation, to New Bridge, near Townsend's wharf, a distance of 3¼ miles, and a width of 100 feet from this wharf to the mouth of the river, a distance of 5 miles. The estimated cost of the improvement is $39,963.

A history of the work done up to June 30, 1905, may be found in the Annual Report of the Chief of Engineers for 1905, pages 175–176.

With $5,500 allotted by the Secretary of War in 1905 from the appropriation made by the river and harbor act of March 3, 1905, for improving Appoquinimink, Murderkill, and Mispillion Rivers, a cut-off was made through the neck of land on the left bank of the river leading to Fennimore's (or New) Bridge, about halfway between the mouth and Odessa. This cut-off shortened the channel distance by 2,272 feet, the distance between Odessa and the 7-foot contour in Delaware Bay being now about 6¾ miles.

Under the provisions of the river and harbor act of March 2, 1907, the Secretary of War, on March 20, 1907, approved an allotment of $6,400 for expenditure on this improvement. Of this amount $5,000 pertained to the act referred to and the remainder was funds pertaining to former allotment. With these funds the channel was dredged to not less than 7 feet deep at mean low water and 50 feet wide between Odessa and the mouth in 1907.

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[1] Exclusive of amount available for fiscal year 1913.

Under date of June 29, 1909, $5,000 was allotted from the appropriation made by the river and harbor act of March 3, 1909, to be applied to the maintenance of the improvement, and with a part of the available funds the channel was dredged from a point just below the drawbridge at Odessa for a distance of 33,000 feet downstream, the depth made being not less than 7 feet at mean low water and the width not less than 50 feet. This work was completed in September, 1909. On March 18, 1910, proposals were opened for dredging with the remaining funds, but the bids were rejected as excessive. Proposals were again advertised for and opened May 24, and under the contract made shoals were removed in August and September, 1910, to a depth of 8 feet at mean low water near Odessa, Quarter Mile Reach, and Rock Reach, resulting in a continuous channel at least 7 feet deep at mean low water and at least 60 feet wide at bottom from Odessa to the mouth.

The river and harbor act of June 25, 1910, appropriated $60,000 for the Appoquinimink, Murderkill, and Mispillion Rivers for continuing improvement and maintenance, and of this amount $6,000 was allotted by the Secretary of War to the Appoquinimink River for maintenance. With this allotment the channel was dredged continuously from the highway bridge at Odessa to a point 7,300 feet below, and farther below several shoals were removed, and at Rock Reach the channel was widened, the operations resulting in a channel not less than 60 feet wide at bottom and 7 feet deep at mean low water from the highway bridge at Odessa to just below the lower end of Webb's wharf, a distance of approximately 5¼ miles.

The sum of $5,000 was allotted for continuing the improvement and for maintenance from the appropriation made by the river and harbor act of February 27, 1911, for improving Appoquinimink, Murderkill, and Mispillion Rivers; and under contract made for its expenditure dredging was begun June 17, 1912, and to the end of the fiscal year the channel had been dredged at various points going downstream from Watkins's wharf, at Odessa, an aggregate length of 2,525 feet, the width made being 60 feet at bottom and the depth 8 feet at mean low water, which included 1 foot overdepth made and allowed under the contract.

The amount expended on this improvement to June 30, 1912, is $53,909.67, of which $18,914.41 was for maintenance.

About four-fifths of the work on the project has been completed.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the river under improvement is 6 feet in the river, and across the flats at the mouth 4 feet. The stream is navigable for small boats drawing 2 or 3 feet to Noxentown milldam, about 4 miles above Odessa. The mean range of tide is 6 feet at the mouth and 3½ feet at Odessa.

The commerce of the river for the calendar year 1911 is reported to have been 31,225 tons, valued at $1,911,450.

The freight rates, it has been reported, remain about the same, but the passenger business has increased in consequence of the improvement of the river.

The river and harbor act of February 27, 1911, provided for a preliminary examination and survey of the river. These have been made, and it is expected that report thereon will be transmitted to Congress during its next session. The survey was made in the fall of 1911.

Report upon an examination of this river, made in 1880, is printed in House Executive Document No. 34, Fifty-sixth Congress, third session, and in the Annual Report of the Chief of Engineers for 1881, page 826.

It is proposed to expend the funds recommended below in dredging for continuing improvement and for maintenance of the improvement to keep it available for navigation.

July 1, 1911, balance unexpended		$10,889.33
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$2,952.85	
For maintenance of improvement	3,099.24	
		6,052.09
July 1, 1912, balance unexpended		4,837.24
July 1, 1912, outstanding liabilities		1,900.00
July 1, 1912, balance available		2,937.24
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		3,500.00
Amount available for fiscal year ending June 30, 1913		6,437.24
July 1, 1912, amount covered by uncompleted contracts		1,600.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		(1)

(*b*) *Murderkill River.*—This river is a tidal stream and a tributary of Delaware Bay and flows through Kent County, Del. Its navigable portion is about 9 miles long. The condition of the river was fair for the greater part of its length, the average width and depth being 90 and 6 feet, respectively. Outside the junction with Delaware Bay, however, there was a serious obstruction—the flats, which are nearly bare at low tide and extend for nearly a mile from the shore.

In 1881 an examination of this river was made and a project submitted for its improvement, report on which is printed in the Annual Report of the Chief of Engineers for 1882, page 817, and in Senate Executive Document No. 141, Forty-seventh Congress, first session. No appropriation was made by Congress, however, as the river was at that time in the hands of an improvement and navigation company chartered by the State. This company had expended about $10,000 in rectifying the many bends of the river by cutting straight canals and in dredging a narrow cut across the flats at the mouth. The latter slowly filled up again.

Under the provisions of the river and harbor act of September 19, 1890, a survey was made and report thereon is printed in House Executive Document No. 21, Fifty-second Congress, first session, and in the Annual Report of the Chief of Engineers for 1892, pages 981 et seq.

The project for improvement, which was adopted in the river and harbor act of July 13, 1892, is for a 7-foot low-water channel, 80 feet wide from the town of Frederica, at the head of navigation, to the mouth of the river, and 150 feet wide from the mouth across the flats

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[1] See consolidated money statement on page 319.

outside, to the 7-foot curve of depth in Delaware Bay, the cut at the mouth to be protected by forming an embankment of the dredged material on each side, the estimated cost being $47,550.

Dredging for original work and for maintenance has been done at different times since 1893. A history of operations to June 30, 1905, will be found in the Annual Report of the Chief of Engineers for 1905, pages 177–178.

In 1907 the river was dredged at various points, resulting in a channel not less than 50 feet wide and 6 feet deep at mean low water from Frederica to the 6-foot curve in Delaware Bay; and in 1908 the channel was redredged across the flats at the mouth and in the river, giving the same result; and with part of an allotment of $7,000 from the appropriation for preservation and maintenance made by the river and harbor act of March 3, 1909, the channel was dredged, in 1909 and 1910, in the river and across the flats at the mouth, resulting in a continuous channel not less than 50 feet wide and 6 feet deep at mean low water from Frederica to the outer end of the flats at the mouth.

In August, 1910, the Secretary of War approved an allotment of $15,000 for continuing improvement and maintenance from the appropriation made by the river and harbor act of June 25, 1910, for improving Appoquinimink, Murderkill, and Mispillion Rivers. With this allotment the channel was dredged in 1911 at various points, resulting in a continuous channel not less than 7 feet deep at mean low water and 60 feet wide at bottom from the head of navigation at Frederica to the 7-foot curve in Delaware Bay, including a turning basin opposite the steamboat landing at Frederica; and with $5,000 allotted from the appropriation of $15,000 made by the act of February 27, 1911, for improving Appoquinimink, Murderkill, and Mispillion Rivers, the channel was dredged this year at various points, restoring the channel to the 60-foot bottom width and 7-foot depth, except for a distance of about 2,000 feet in Broad Reach, along oyster beds, where the channel has the project depth and 30 feet and over in width.

The amount expended on this improvement to June 30, 1912, is $76,840.94, of which $39,210.87 was for maintenance.

About 65 per cent of the project has been completed.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the river under improvement to Delaware Bay is 7 feet. The average rise and fall of the tide is 4.6 feet at the mouth and 2.5 feet at Frederica.

It has been impracticable to secure commercial statistics for the calendar year 1911, but the commerce reported for 1910, which was quite varied, was 35,173 short tons, valued at $1,437,200.

As to the effect of the improvement of this stream upon freight rates it is reported that rates by water are 25 to 50 per cent lower than by rail and that in winter, when the boats can not run, the railroad increases its rates.

The river and harbor act of February 27, 1911, provided for a preliminary examination and survey of this river and reports on them have been submitted. The survey was made in the fall of 1911.

It is proposed to expend the funds asked for below in dredging under the project and for maintenance to keep the channel available for navigation.

July 1, 1911, balance unexpended		$19,858.60
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$14,269.29	
For maintenance of improvement	4,479.26	
		18,748.55
July 1, 1912, balance unexpended		1,110.05
July 1, 1912, outstanding liabilities		150.00
July 1, 1912, balance available		960.05
Amount allotted from appropriation made by river and harbor act, approved July 25, 1912		3,000.00
Amount available for fiscal year ending June 30, 1913		3,960.05
Amount (estimated) required to be appropriated for completion of existing project		[1] 12,264.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		(2)

(c) *Mispillion River.*—This river is a tidal stream which enters Delaware Bay about 17 miles northwest of Cape Henlopen. It is navigable for about 12 miles. The mouth of the river was greatly obstructed by a flat foreshore without a channel. Vessels could enter and depart only at high water, the tidal range being about 4 feet.

The river from Milford, the head of navigation, to the mouth was improved by the General Government between the years 1879 and 1889, and $17,000 was expended in making a channel 40 feet wide and 6 feet deep at mean low water, and its further improvement was carried on to November, 1906, under a project adopted in the river and harbor act of July 13, 1892. This resulted in a channel 40 feet wide and 4½ feet deep at mean low water from Milford to the mouth and 50 feet wide and 5 feet deep thence to the 5-foot contour in Delaware Bay; and two jetties at the mouth, one, the north jetty, extending from the east bank of the river a length of 1,645 feet, and the other, the south or Green Point jetty, extending from Green Point, just below the mouth of Cedar Creek, a distance of 1,100 feet, 500 feet of the outer end being parallel to and 100 feet distant from the axis of the dredged channel, and 200 feet from the north jetty.

The present project was adopted in the river and harbor act of March 2, 1907, and is based upon the report printed in House Document No. 102, Fifty-sixth Congress, second session. This provides for dredging the channel 6 feet deep at mean low water and 60 feet wide, increasing to 75 feet at sharp turns, from Milford to the mouth, and thence 4 feet deep and 150 feet wide across the flats, and the construction of a jetty along the south side of the channel, at an estimated cost of $87,065.

From the appropriation made by the act of March 2, 1907, for improving the Appoquinimink, Murderkill, and Mispillion Rivers, Del., $40,000 was allotted for the Mispillion, with which an extension has been built to the south jetty, 2,200 feet long, parallel to and 100 feet distant from the axis of the channel, and extending in a southeasterly direction into a natural depth of 2 feet at mean low water on the flats of Delaware Bay. Under a contract for dredging, which was completed in July, 1908, the operations resulted in a channel not less than 5 feet deep at mean low water and 50 feet wide from the 4-foot curve in Delaware Bay to the lighthouse, and not less than 6 feet deep and 40 feet wide thence to the electric light works in the town of Milford. The depth made includes 1 foot overdepth made under the contract.

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[1] Exclusive of amount available for fiscal year 1913.
[2] See consolidated money statement on page 319.

Under date of June 17, 1909, the sum of $7,000 was allotted to the Mispillion River improvement from the appropriation for preservation and maintenance made by the river and harbor act of March 3, 1909, and with this allotment the channel was dredged in 1909 and 1910, resulting in a continuous channel at least 5 feet deep at mean low water and 50 feet wide at bottom from Milford to the mouth and at least 4 feet deep and 100 feet wide thence to the 4-foot contour in Delaware Bay.

Under date of August 30, 1910, the sum of $39,000 was allotted from the $60,000 appropriated for the Appoquinimink, Murderkill, and Mispillion Rivers by the river and harbor act of June 25, 1910, for continuing improvement and maintenance, and with this allotment the channel was dredged 60 feet wide at bottom and 7 feet deep at mean low water, which included 1 foot overdepth made and allowed under the contract from Milford, the head of navigation, to Gravel Reach, 8 miles downstream. The dredging was continuous from Milford to New Wharf, a distance of about 5 miles, and the channel was widened and deepened to project dimensions at several places below, giving a 7-foot mean low-water channel from Milford to the mouth, and at the south jetty at the mouth an extension of 1,800.5 linear feet of stone, brush, and pile jetty was built, making its total length 5,300 feet from the shore to the 4-foot curve in Delaware Bay. At the outer end of the jetty a cluster of seven white oak piles was driven, showing above the top of the jetty, as a protection and marker. In addition, 96 cubic yards of stone filling was placed in the inner section of the jetty where the original filling had settled. This was completed in December, 1911. And with an allotment of $5,000 from the appropriation made by the river and harbor act of February 27, 1911, for improving Appoquinimink, Murderkill, and Mispillion Rivers, the north pile, brush, and stone jetty at the mouth was extended for a length of 400 feet for the protection of the existing channel.

The amount expended on this improvement to June 30, 1912, is $169,152.04; of this amount $90,761.97 was on the present project. Of the latter amount $25,353.63 was for maintenance and $65,408.34 for continuing the project.

About 75 per cent of the project has been completed.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the stream under improvement was 6 feet in the river and 4 feet across the flats at the mouth. The range of the tide is 4½ feet at the mouth and 3½ feet at Milford.

It has been impracticable to obtain commercial statistics for the calendar year 1911. The commerce for 1910 was reported at 191,745 short tons, valued at $5,133,500.

The effect of the improvement on freight rates is stated to be quite marked, a reduction of an average of 25 per cent being reported. In addition, better and increased transportation facilities are afforded.

The river and harbor act of February 27, 1911, provided for an examination and survey of the river, and report thereon is printed in House Document No. 678, Sixty-second Congress, second session.

Under the present project the depth to be made across the flats at the mouth is only 4 feet, whereas that in the river is 6 feet. It is recommended that the depth be made 6 feet to the Delaware Bay.

It is proposed to expend the amount asked for below in dredging in accordance with the adopted project and for the maintenance of the improvement to keep it available for navigation.

Reports on examinations and surveys are printed in the Annual Report of the Chief of Engineers for 1879, page 467; for 1882, page 769 (H. Ex. Doc. No. 141, 47th Cong., 1st sess.); and in the Annual Report of the Chief of Engineers for 1892, page 988 (H. Doc. No. 57, 52d Cong., 1st sess.).

July 1, 1911, balance unexpended		$27,451.23
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$22,213.20	
For maintenance of improvement	5,000.00	
		27,213.20
July 1, 1912, balance unexpended		238.03
July 1, 1912, outstanding liabilities		100.00
July 1, 1912, balance available		138.03
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		6,000.00
Amount available for fiscal year ending June 30, 1913		6,138.03
Amount (estimated) required to be appropriated for completion of existing project		[1] 12,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		(2)

CONSOLIDATED.

July 1, 1911, balance unexpended		$58,199.16
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$39,435.34	
For maintenance of improvement	12,578.50	
		52,013.84
July 1, 1912, balance unexpended		6,185.32
July 1, 1912, outstanding liabilities		2,150.00
July 1, 1912, balance available		4,035.32
Amount appropriated by river and harbor act approved July 25, 1912		12,500.00
Amount available for fiscal year ending June 30, 1913		16,535.32
July 1, 1912, amount covered by uncompleted contracts		1,600.00
Amount (estimated) required to be appropriated for completion of existing project		[1] 24,264.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 27,000.00

(See Appendix I 16.)

17. St. Jones River, Del.—Before the channel was improved the least practicable low water depth to Lebanon, 12 miles above the mouth, was 4 feet, and thence to Dover, 9 miles farther up the river, only 2½ feet.

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[1] Exclusive of amount available for fiscal year 1913.
[2] See consolidated money statement on this page.

In 1880 a survey was made under the provisions of the river and harbor act of June 14, 1880, which resulted in a project under which a channel 6 feet deep at mean low water and 40 feet wide was dredged between 1885 and 1889 from Dover to Delaware Bay. This included a turning basin 180 feet long and 80 feet wide, and a cut-off at Cherry Bend 1,020 feet long and 40 feet wide, at a cost of $40,000; and thereafter dredging operations have been confined to dredging between the Delaware Bay and Lebanon. Details of work done under the project will be found in the Annual Report of the Chief of Engineers for 1911.

The present project, which was adopted in the river and harbor act of June 25, 1910, is based upon a survey made in 1908, report upon which is printed in House Document No. 1116, Sixtieth Congress, second session, and provides for a depth of 7 feet at mean low water, with widths varying in different reaches between Dover and Delaware Bay, including 16 cut-offs and a pile, brush, and stone jetty on the north side at the mouth, at an estimated cost of $181,425 and $1,700 annually for maintenance after completion.

The river and harbor act of June 25, 1910, provides that no part of the appropriation therein made shall be expended until satisfactory title to the land required for the necessary cut-offs shall have been furnished to the United States free of cost; and the river and harbor act of February 27, 1911, appropriated $11,700 for continuing improvements and for maintenance, with the proviso that no part thereof be expended, except for maintenance, until the title referred to shall have been furnished. Dredging being urgently needed for maintenance of the channel, a subproject has been approved by the Chief or Engineers, under which the channel is to be redredged from Lebanon to Delaware Bay to a depth of 6 feet at mean low water, the width to be 40 feet in the river and 50 feet across the flats at the mouth. The work is to be begun soon.

The amount expended on the improvement to June 30, 1912, is $70,533.37, of which $23,224.10 was for maintenance. All these funds were expended on projects previous to that adopted in the river and harbor act of June 25, 1910.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the improvement between Lebanon and the Delaware River was 4 feet. The range of tide is 4½ feet at the mouth, 2 feet at Lebanon, and 1.6 feet at Dover, the head of navigation, 17 miles above the mouth.

The commerce of the river for the calendar year 1911 is reported to have been 100,154 tons, valued at $5,876,550. It consists of agricultural products, canned goods, general merchandise, etc.

It is stated that the improvements made have reduced freight rates by one-fourth to one-half, besides increasing shipments, especially fruits, which now reach the market in less time and in fresher condition.

The title papers for the land required for a number of the proposed cut-offs have been submitted, and it is stated that the remainder will be furnished soon.

Reports on examination and surveys are printed in the Annual Report of the Chief of Engineers for 1881, page 801 (H. Ex. Doc. No. 34, 46th Cong., 3d sess.); Annual Report of the Chief of Engineers for 1893, page 1229 (H. Ex. Doc. No. 34, 52d Cong., 2d sess.); Annual Report of the Chief of Engineers for 1897, page 1290 (H. Ex.

Doc. No. 85, 54th Cong., 2d sess.; and Annual Report of the Chief of Engineers for 1900, page 1662 (H. Doc. No. 166, 56th Cong., 1st sess.).

It is proposed to expend the amount asked for below in dredging for maintenance of the improvement to keep it available for navigation.

July 1, 1911, balance unexpended	$36,723.13
July 1, 1912, balance unexpended	36,723.13
Amount (estimated) required to be appropriated for completion of existing project	[1] 144,725.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

(See Appendix I 17.)

18. Little River, Del.—This is a new project, for which provision is made in the river and harbor act of July 25, 1912, in accordance with the plan printed in House Document No. 626, Sixty-second Congress, second session, upon the condition specified in said report.

This is a tidal stream about 8 miles long emptying into Delaware Bay about 70 miles below Philadelphia. The town of Little Creek, 3½ miles above the mouth, is practically the head of navigation. The range of tide is about 5 feet at the mouth and 4.3 feet at the drawbridge at the town. The controlling depth over the flats at the mouth is about 3 feet at mean low water and within the river it is about 4 feet, with occasional depth of as much as 12 feet.

The project for this improvement is based upon a survey made in 1911, and provides for securing an available channel depth of 5 feet from the town of Little Creek and a width of 40 feet, increased to 60 feet across the flats at the mouth, at an estimated cost of $14,000 for first construction, with $1,000 annually for maintenance. The plan of improvement includes five cut-offs.

It is proposed to expend the funds recommended below in dredging for maintenance of the improvement.

Amount appropriated by river and harbor act approved July 25, 1912	$14,000.00
Amount available for fiscal year 1913	14,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2] 1,000.00

(See Appendix I 18.)

19. Smyrna River, Del.—This river was formerly known as Duck Creek. It is a tidal stream flowing easterly into the Delaware River at a point about 26 miles south of Wilmington, Del. The navigable portion of the river was originally about 9 miles long; the minimum mean low-water depth over shoal places was 2½ feet in the river and 4 feet at the bar where it enters the Delaware River.

In 1878 a project was made for the improvement of the whole river, including the channel across the bar at the mouth. By direction of Congress the improvement of the bar was commenced first, and during the following four years three appropriations, aggregating $10,000, were expended in dredging a channel 100 feet wide and 8 feet deep at mean low water across the bar. The dredged channel soon filled up again.

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[1] Exclusive of the balance unexpended July 1, 1912.
[2] Exclusive of amount available for fiscal year 1913.

A new project was adopted in the river and harbor act of August 11, 1888, with a view of obtaining a channel of 7 feet depth throughout, width of 60 feet in the river and 100 feet at the bar, the channel over the bar to be protected by a stone jetty. The estimated cost of the improvement was $90,698.40. Of this, $37,365.20 was for dredging and $53,333.20 for the jetty. This act made the first appropriation for work on the project and was by its terms to be applied to dredging only. The subsequent appropriations for continuing the improvement have also been applied to dredging.

In 1904 the channel was dredged to a width of 50 feet and a depth of 6 feet at mean low water from the 6-foot curve just inside the mouth to the 6-foot curve in Delaware Bay, and in 1905, with an appropriation of $15,000 made by the river and harbor act of June 13, 1902, as modified by the act of March 3, 1905, two cut-offs were made extending from just below Limekiln Wharf to the turn just above Brick Store Wharf, an aggregate length of 4,795 feet. Some shoals in the river and the channel across the flats at the mouth also were dredged, resulting in a channel 7 feet deep at mean low water from Smyrna Landing to the 7-foot curve in Delaware Bay, the widths being 60 feet through the cut-offs, not less than 50 feet in the river, and 100 feet across the flats at the mouth. This work at the mouth completed the dredging required under the approved project.

In 1906 and 1907 the channel in the river was dredged, resulting in a channel width not less than 50 feet nor less than 6 feet depth from Smyrna Landing to the 6-foot depth in Delaware Bay, except in the Cherry Tree Reach, about halfway between Smyrna Landing and the mouth, where the depth was only 5 feet; and in May and June, 1908, the channel was dredged from inside the river at the mouth to the 7-foot depth in Delaware Bay to a depth of not less than 7 feet at mean low water and a width of 100 feet.

Under date of June 9, 1909, $6,500 was allotted from the appropriation made by the river and harbor act of March 3, 1909, for the maintenance of the improvement, and under a contract made for the expenditure of a part of the available funds, dredging operations were carried on from September to December, 1909, resulting in a continuous channel not less than 50 feet wide and 6 feet deep at mean low water from Smyrna Landing to the 6-foot curve in Delaware Bay.

The amount expended on this improvement to June 30, 1912, is $77,776.67, of which $22,691.89 was for maintenance. This was on projects previous to that adopted by the river and harbor act of June 25, 1910.

No work was done in the fiscal year ending June 30, 1912. The expenditure was for an examination and contingent expenses.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the stream under improvement was 5 feet in the river to Smyrna, the head of navigation, and 6 feet across the flats at the mouth. The navigable length to Smyrna is 10 miles. The mean range of tide at the mouth is nearly 6 feet, and at Smyrna about 3 feet.

It was impracticable to obtain commercial statistics for the calendar year 1911. The commerce for 1909 was reported to have been 203,580 short tons, valued at $4,979,740.

The effect of the improvement of this river on freight rates has been to reduce them by about 25 per cent, and in addition it has resulted in the saving of time in shipments to Philadelphia and elsewhere. These conditions have stimulated certain industries, especially the fruit culture, and largely increased the production in this section.

The river and harbor at of June 25, 1910, appropriated $25,000 for maintenance and continuing improvement in accordance with the report submitted in House Document No. 815, Sixtieth Congress, first session, and provided that no part of said amount should be expended until satisfactory title to the land required for the necessary cut-offs has been transferred to the United States free of cost.

The project adopted in this enactment contemplates a channel of the same dimensions as the existing project, with three new cut-offs to eliminate troublesome bends, and the construction of jetties to aid in maintaining the channel at the mouth, at a cost of $89,000.

The river and harbor act of February 27, 1911, appropriated a further sum of $15,000 upon the same conditions as those contained in the act of June 25, 1910, but no part of these two appropriations has been expended, as the requirements therein that title for the necessary cut-offs be furnished to the United States free of cost have not yet been complied with. It is stated, however, by parties interested in the improvement that the title papers will be furnished soon. A project for the expenditure of the available funds has been approved, and work will be begun as soon as satisfactory title is furnished.

Reports on preliminary examinations and surveys are printed in the Annual Report of the Chief of Engineers for 1879, page 470; in the report for 1887, page 847; and in Annual Report of the Chief of Engineers for 1901, page 1301 (H. Doc. 90, 56th Cong., 2d sess.).

July 1, 1911, balance unexpended	$40,075.96
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	45.00
July 1, 1912, balance unexpended	40,030.96
Amount (estimated) required to be appropriated for completion of existing project	[1]49,000.00

(See Appendix I 19.)

20. *Leipsic River, Del.*—This is a tidal stream which enters Delaware Bay about 10½ miles below Bombay Hook Light at the mouth of Smyrna River. At the time of the survey about 7 feet draft could be carried, with varying widths, across the bar at the mouth and to within 1 miles of Garrison's mill, the head of navigation, a distance of about 18 miles. The town of Leipsic is about 5½ miles below.

No money has heretofore been expended on this stream by the Federal Government.

The present project was adopted by the river and harbor act of June 25, 1910, and is based upon a survey made in 1909, report on which is printed in House Document No. 574, Sixty-first Congress, second session. It provides for making cut-offs—numbered 2, 3, and 4 on plan submitted with the report—located between the necks of land formed by the course of the Leipsic River between the mouth and the town of Leipsic, the width and depth to be 50 feet at bottom and 6 feet at mean low water, respectively, at an estimated cost of $18,500, the remainder of the project proposed in the report to await the result of this work.

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[1] Exclusive of the balance unexpended July 1, 1912.

This work was completed in September, 1911. A channel 50 feet wide at bottom, with 1-on-1 slopes and 7 feet deep at mean low water, was made through each of the cut-offs. The depth included 1 foot overdepth made and allowed under the contract. The cut-offs shorten the river about 2 miles.

The amount expended on this improvement to June 30, 1912, is $9,557.99, no part of which was for maintenance.

The existing project was modified by the river and harbor act approved July 25, 1912, so as to provide for making cut-offs numbered 1 and 5, in accordance with plan printed in the document above referred to, subject to the condition that the land required for making said cut-offs, or easements therein, shall be furnished free of cost to the United States, and that the United States shall be released from all claims for damages arising from the proposed diversion of the stream.

The act of 1912 also adopted a further project for improvement of this stream, in accordance with plan printed in House Document No. 647, Sixty-second Congress, second session, which contemplates securing an available channel depth of 5 feet and a bottom width of 40 feet from Leipsic to Garrison's mill, including one cut-off and a turning basin at Garrison's mill, at an estimated cost of $19,600 for first construction, with $1,500 for maintenance, provided local interests furnish the necessary right of way free of cost to the United States, and that all obstructions at Martins Bridge are removed prior to the work being undertaken by the United States. The act makes an appropriation of the full amount required for doing this work.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the river was about 6 feet and over at the bar at the mouth 6½ feet. The range of tide is 5.3 feet at the mouth, 3 feet at Leipsic, and 2.4 feet at Garrison's mill.

The commerce of the river for the calendar year 1911 is reported to have been 15,498 tons, valued at $327,208. It consisted largely of agricultural products and canned goods.

The river and harbor act of February 27, 1911, provided for an examination and survey of the river, and report thereon is printed in House Document No. 647, Sixty-second Congress, second session.

A preliminary examination was made in 1882, the report upon which is printed in the Annual Report of the Chief of Engineers for 1884, page 854 (S. Doc. No. 59, 48th Cong., 1st sess.).

July 1, 1911, balance unexpended	$18,437.58
June 30, 1912, amount expended during fiscal year, for works of improvement	9,495.57
July 1, 1912, balance unexpended	8,942.01
Amount appropriated by river and harbor act approved July 25, 1912	19,600.00
Amount available for fiscal year ending June 30, 1913	28,542.01
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]5,000.00

(See Appendix I 20.)

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[1] Exclusive of amount available for fiscal year 1913.

21. Broadkill River, Del.—In its original condition the depth of water in the river was from 3 to 4 feet at the numerous shoals, which impeded navigation. The depth at the mouth was from 1½ to 2 feet at low water.

Prior to the adoption of the existing project, $35,000 was expended in providing a channel within the river 6 feet deep and 40 feet wide at low water from the mouth to Milton, a distance of about 12½ miles.

An examination was made of the mouth of the river in 1894, report on which is printed in the Annual Report of the Chief of Engineers for 1895, page 1151, and in House Executive Document No. 70, Fifty-third Congress, third session.

The present project was adopted in the river and harbor act of March 2, 1907, and is based upon report and estimate submitted in House Document No. 214, Fifty-ninth Congress, second-session. It provides for the establishment of a permanent entrance at the mouth of the river by dredging a channel from the 6-foot curve in Delaware Bay to the same depth in the river and constructing a jetty on the north side of this channel.

The river and harbor act of March 2, 1907, appropriated $33,330 for the work. The land needed for the cut to be made across Lewes Cape was deeded to the United States free of cost; the jetty across Lewes Cape and Lewes Sound from the 6½ to 7 foot depth in Delaware Bay to the high-water line in the marsh of Lewes Sound on its western side, a total length of 1,263 feet, was completed in November, 1908; and a channel 6 feet deep and 150 feet wide at bottom was dredged from the 6-foot depth in Delaware Bay to the same depth in Lewes Sound. This was done in 1908 and completed the project. In 1908–9, $7,282.67 was expended in the repair and restoration of the jetty, and with an allotment of $3,000 from the appropriation made by the river and harbor act of March 3, 1909, 729 tons of stone was placed in the jetty, filling the structure across the old creek to the top of the piling, and the remainder to the top of the waling.

The river and harbor act of June 25, 1910, appropriated $5,000 for maintenance of the improvement, but the proposals received for part of the repairs then needed were found excessive and were rejected. The river and harbor act of February 27, 1911, appropriated $10,000 for maintenance. With these combined appropriations dredging and jetty work were done. The channel was dredged from Milton to a point about 8 miles below to a depth of 6 feet and a width of 40 feet, resulting in a channel not less than 5 feet deep at mean low water from Milton to the mouth; and work has been in progress since the early part of May, 1912, in reinforcing and repairing the jetty at the mouth.

The amount expended on this improvement to June 30, 1912, was $86,666.18, of which $51,636.18 is on the present project. Of the latter amount $18,438.21 was for maintenance.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the improvement was 5 feet in the river and 4 feet at the mouth.

It has been impracticable to obtain complete commercial statistics. The commerce reported for the calendar year 1910 was 10,929 short tons, valued at $320,105.

The water rates are about two-thirds of those by rail. These rates are not expected to be lowered by the improvement of the stream, but better service will make them of more value to the community and largely increase the amount of freight.

It is proposed to expend the amount recommended below in dredging the channel from Delaware Bay to the head of navigation at Milton, and to repair the jetty at the mouth, both for the maintenance of the improvement and to keep the locality available for navigation.

In the opinion of the local officer certain additional works are desirable in connection with this improvement and a reexamination of the project is therefore recommended.

July 1, 1911, balance unexpended	$14,823.31
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	7,526.82
July 1, 1912, balance unexpended	7,296.49
July 1, 1912, outstanding liabilities	1,550.00
July 1, 1912, balance available	5,746.49
Amount appropriated by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	10,746.49
July 1, 1912, amount covered by uncompleted contracts	5,450.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

(See Appendix I 21.)

22. Inland Waterway between Rehoboth Bay and Delaware Bay, Del.—This is a new project for which provision is made in the river and harbor act of July 25, 1912, in accordance with the reports submitted in House Document No. 823, Sixtieth Congress, first session, and in Rivers and Harbors Committee Document No. 51, Sixty-first Congress, third session, and subject to the conditions that the land needed for right of way, or easements therein, shall be furnished free of cost to the United States.

The improvement contemplated embraces the section between Rehoboth Bay and Delaware Bay of a former project for the inland waterway between Chincoteague Bay, Va., and Delaware Bay, Del., on slightly different lines, avoiding, as far as possible, the high lands on the route, and following Lewes Creek nearly to its mouth and thence by a short cut into Broadkill River just above its mouth. The plan provides for constructing a canal 6 feet deep at mean low water and 50 feet wide at bottom, narrowing to 40 feet where it passes through deep cutting, at an estimated cost of $356,000, including items for dredging, purchase of land for right of way, and two bridges. The estimate for the purchase of the land, which, by the act above quoted, is to be furnished to the United States free of cost, was $14,275.

The tidal range at the mouth of Lewes Creek on the bay shore is about 4 feet and at Lewes about 2 feet. There is no tidal variation in Rehoboth Bay, differences of level depending upon the winds.

From Rehoboth Bay to Lewes along the line of the proposed canal is about 7¼ miles, and from Lewes to the new mouth of the Broadkill 4¼ miles, making the total length 11½ miles.

It is proposed to apply the funds asked for below in dredging in continuation of the project.

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[1] Exclusive of amount available for fiscal year 1913.

Amount appropriated by river and harbor act approved July 25, 1912	$50,000.00
Amount available for fiscal year 1913	50,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 291,725.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 41,725.00

(See Appendix I 22.)

23. *Waterway on the coast of Virginia.*—This is a new project, for which provision is made in the river and harbor act of June 25, 1910.

The project for this improvement is based on a survey made in 1908, report upon which is printed in House Document No. 957, Sixtieth Congress, first session, and provides for dredging a channel 4 feet deep at mean low water through Cat River and across Bogues Bay from Cat River into Island Hole Narrows, with bottom widths of 25 feet in Cat River and 50 feet in Bogues Bay, widening the channel where necessary at sharp bends, at an estimated cost of $12,100, with $1,200 annually for maintenance after completion.

Soundings taken across Bogues Bay and through Cat River to its junction with Hog Creek showed mean low-water depths in Cat River ranging from 1.5 to 9.5 feet, and in Bogues Bay from 0.5 of a foot to 4 feet.

The work required by the project was done during the fiscal year, and resulted in a channel 12,530 feet long with a minimum depth of 5 feet, which included 1 foot overdepth made and allowed under the contract, connecting wide and deep waterways north and south. The widths made were 50 feet at bottom across Bogues Bay and at the entrance thereto at Island Hole Narrows, and not less than 25 feet, widening at sharp turns, in Cat River.

The amount expended on this improvement to June 30, 1912, is $9,264.45, no part of which was for maintenance.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the improvement was 5 feet. The mean range of tide is 3.4 feet at Island Hole Narrows and 2.9 feet on Cat River 1,500 feet south of Bogues Bay.

The commerce for the calendar year 1911 is reported to have been 47,169 short tons, valued at $947,900. This consisted of oysters and clams, lumber, iron supplies, etc.

No funds in addition to those on hand are required for the fiscal year 1914.

July 1, 1911, balance unexpended	$11,977.94
June 30, 1912, amount expended during fiscal year, for works of improvement	9,142.39
July 1, 1912, balance unexpended	2,835.55
July 1, 1912, outstanding liabilities	140.00
July 1, 1912, balance available	2,695.55

(See Appendix I 23.)

24. *Removing sunken vessels or craft obstructing or endangering navigation.*—During the past fiscal year wrecks were removed or examined as follows:

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[1] Exclusive of amount available for fiscal year 1913.

Wreck of steamer *Major W. Allen*, lying sunk at Cold Spring Inlet, N. J. Contract made for its removal, and cost to date is $106.16.

Wreck reported to be that of schooner *Florence I. Lockwood*, lying sunk in Chincoteague Inlet, Va. Wreckage believed to be a part of the schooner *Florence I. Lockwood* removed without charge by the contractor. Cost of inspection, etc., $159.98.

Wreck of sloop *Glide*, lying sunk in Lewis Creek, Del. Removed at a cost of $150.

Wreck of dredge *Townsen*, lying in entrance channel into Grassy Sound, N. J. Removed at a cost of $280.

Wreck of deck scow *John E. King*, lying sunk in Salem River, N. J. Examined and arrangements in progress for removal. Cost of examination, $20.

Wreck of steamer *Marie Thomas*, lying sunk in Broadkill River, Del. Removed at a cost of $495.12, including $25 for an examination.

Wreck of barge *Maryland*, lying sunk in Atlantic Ocean off Corsons Inlet, N. J. Removed at a cost of $1,680, including $75 for an examination.

Wreck of schooner *Rose*, lying in Assateague Entrance, Va. Wreck buoyed and marked, as beneficial to shipping interests. Cost, $5.

Wreck of coal barge *Saratoga*, lying in inland waterway of New Jersey. Removed at a total cost of $395, of which $3.76 remains unpaid. This includes examination and superintendence and inspection.

Wreck of steamer *Ranald*, lying sunk in Atlantic Ocean off Atlantic City, N. J. Work of removal began on June 29, 1912. Cost to date, including examination, $178.56.

Wreck of barge *Elsie*, lying sunk in the upper Chistiana River, Del. Proposals for removal to be opened July 13, 1912. Cost to date, including examination, $41.96.

Wreck of schooner *Carrie*, lying sunk in Little River, Del. Examined and found not to be an obstruction of any importance. Cost of examination, $20.

Wreck of two-masted schooner sunk off Hereford Inlet, N. J. Removed by revenue cutter *Mohawk* at cost of $142.35. This amount refunded by Engineer Department to Treasury Department by Treasury settlement May 31, 1912.

The expenditures during the year amounted to $3,670.37.

(See Appendix I 24.)

EXAMINATION AND SURVEY REQUIRED BY THE RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

The local officer was charged with the duty of making a preliminary examination and survey, required by the river and harbor act of March 3, 1909, *of Chincoteague Inlet, Va., with a view to obtaining a channel depth of 15 feet*, and reports thereon will be duly submitted when received.

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and surveys required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. *Preliminary examination of Ridley River, Pa.*—Report dated October 24, 1910, is printed in House Document No. 259, Sixty-second Congress, second session. The improvement of this stream by the United States in the manner apparently desired is not deemed advisable at the present time.

2. *Preliminary examination of Darby River, Pa.*—Report dated October 24, 1910, is printed in House Document No. 266, Sixty-second Congress, second session. The improvement of this stream by the United States in the manner apparently desired is not deemed advisable at the present time.

3. *Preliminary examination and survey of Woodbury Creek, N. J.*—Reports dated December 6, 1910, and February 15, 1912, with maps, are printed in House Document No. 635, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $38,000 for first construction, with $2,000 annually for maintenance, is presented, subject to the condition that local interests furnish free of cost to the United States the land necessary for the cut-offs and for deposit of dredged material.

4. *Preliminary examination and survey of Chester River, Pa.*—Reports dated April 3 and December 19, 1911, with map, are printed in House Document No. 677, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $3,600 for first construction, with $550 annually for maintenance, is presented.

The local officer was also charged with the duty of making other preliminary examinations and surveys, provided for by the river and harbor act approved June 25, 1910, as follows, and reports thereon will be duly submitted when received:

1. *St. Martins River, Md., in Worcester County.*
2. *Sinepuxent Bay, Md.*, with a view to a channel 5 feet in depth from the mouth of St. Martins River south.
3. *Cooper Creek, N. J.*, with a view to an increased depth and an extension of the project.
4. *Pensauken Creek, N. J.*

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Reports on preliminary examinations and surveys required by the river and harbor act approved February 27, 1911, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. Reexamination of Wilmington Harbor, Del., with a view to determining a method by which an improvement adequate for the needs of commerce can be maintained at less cost.—Report dated October 6, 1911, by a board of engineer officers, is printed in House Document No. 359, Sixty-second Congress, second session. The existing project for this harbor is deemed adequate for the needs of commerce; but the most economical method of maintaining the project is by a Government-owned dredge, estimated to cost $250,000, with $30,000 annually for its operation, which project is recommended.

2. Preliminary examination and survey of Little River, Del.—Reports dated July 26, 1911, and January 19, 1912, are printed in House Document No. 626, Sixty-second Congress, second session. A plan for improvement at an estimated cost of $14,000 for first construction, with $1,000 annually for maintenance, is presented.

3. Preliminary examination, with plan and estimate of cost of improvement, of Leipsic River, Del.—Reports dated June 3 and December 19, 1911, are printed in House Document No. 647, Sixty-second Congress, second session. A plan for improvement at an estimated cost of $19,600 for first construction, with $1,500 annually for maintenance, subject to certain specified local cooperation, is presented.

4. Preliminary examination, with plan and estimate of cost of improvement, of Mispillion River, Del.—Reports dated June 2 and November 28, 1911, with map, are printed in House Document No. 678, Sixty-second Congress, second session. A plan of improvement, at an estimated cost of $70,400 for first construction, with $5,000 annually for maintenance, subject to certain specified conditions, is presented.

The local officer was also charged with the duty of making other preliminary examinations and surveys required by the river and harbor act approved February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. Appoquinnimink River, Del.
2. Murderkill River, Del.

IMPROVEMENT OF RIVERS AND HARBORS IN THE BALTIMORE, MD., DISTRICT.

This district was in the charge of Col. Thomas L. Casey, Corps of Engineers to December 21, 1911, and of Lieut. Col. W. C. Langfitt, Corps of Engineers, since that date. Division Engineer, Col. William T. Rossell, Corps of Engineers.

1. Patapsco River and channel to Baltimore, Md.—Before operations were begun by the United States a controlling depth of 17 feet was available at low tide and slightly more than 18 feet at high tide. Vessels over that draft were obliged to lighter portions of their cargoes about 14 miles below to permit them to reach the wharves of the city. There were pockets where deeper water prevailed, but these were unconnected by any channel, natural or artificial. The source of the river is in Carroll County, Md., and its mouth at North and

Bodkin Points, Md., where it empties into the Chesapeake Bay. Its general course is southeasterly. The length of the particular section included in the project is 20 miles in Patapsco River and Chesapeake Bay above Sandy Point and about 4½ miles in the lower Bay opposite York Spit. The distance of the lower end of the upper section is about 9 miles below the mouth of the river, and of the York Spit section about 158 miles. Under the original project, dated April 15, 1853, for a channel 22 feet deep at mean low water and 150 feet wide, the Fort McHenry Channel was dredged, extending from the limits of the city of Baltimore to a point just below Fort Carroll, and the Brewerton Channel from this point to deep water of Chesapeake Bay off Swan Point. The cost was $390,000.

In 1871 the project was enlarged to a width of 400 feet at the lower end of the channel, diminishing to 250 feet at its upper end, with a mean low-water depth of 24 feet. Meantime it had been found that the portion of the Brewerton Channel which was swept across by the current of the Susquehanna River was continually obstructed by sedimentary deposit. This led to a search for a better location for a deep channel which could be made and maintained by dredging and the natural currents. This was found in the position of the resultant of the two great forces made by the currents of the Susquehanna and Patapsco Rivers. The new channel had also the advantage of being shorter by several miles, and for this reason and the very much diminished sedimentary deposit the cost of maintenance was much lessened. In 1892 a project for 27 feet depth at mean low water, with a width of 600 feet in the straight sections and over 1,200 feet in the angles, was completed. At the same time the portion of the Brewerton Channel between the upper end of the present cut-off and the point of intersection of the Brewerton and Craighill Channels was abandoned because of the sedimentary deposit from the Susquehanna sweeping across it and to shorten the channel still further and lessen the cost of maintenance. The act of June 3, 1896, authorized the increase of the depth of the channel to 30 feet at mean low water, with a bottom width of 600 feet, widened at the angles, and with side slopes of 3 base to 1 vertical. This was completed May 22, 1903, and has since been maintained. The amount expended on original and modified projects prior to operations under existing project is $4,776,269.48, of which $32,797.72 was for maintenance.

The existing project, adopted by the river and harbor act of March 3, 1905, printed in the Annual Report of the Chief of Engineers for 1903, pages 1032–1033, provided for a channel 35 feet deep at mean low water and 600 feet wide at bottom, and with side slopes of 3 base to 1 vertical from Fort McHenry to deep water in Chesapeake Bay above Sandy Point Lighthouse and through the shoals opposite York Spit, at an estimated cost of $3,465,000. This project was extended by the act of March 3, 1909, to include the widening of the Fort McHenry division near its intersection with the Curtis Bay channel, so as to provide an anchorage basin 600 feet wide and about 3,500 feet long, with project depth within the limit of the original estimate, and still later extended by the act of February 27, 1911, to include increased width of channel at the entrances and in the bends, as well as for maintenance, within the unexpended balance of appropriations heretofore made.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Section near Baltimore [1]	House	57	Fifty-third	Third	1895	1201
Do.[1]	do	50	Fifty-fourth	Second	1897	1306
Entire work [1]	Senate	118	Fifty-sixth	do	1901	1395
Do.[1]	House	186	Fifty-seventh	do	1903	1082

[1] No maps.

The existing project with all modifications incorporated is as follows:

A channel 35 feet deep at mean low water and 600 feet wide at bottom with increased widths at the entrances and in the bends, from Fort McHenry to deep water in Chesapeake Bay above Sandy Point lighthouse, and through the shoals opposite York Spit, and an anchorage basin 600 feet wide and about 3,500 feet long near the intersection of the Fort McHenry and Curtis Bay Channels, with side slopes of three base to one vertical. Work under contract has been in progress during the fiscal year with the results that the widening of the Cutoff-Brewerton and the Cutoff-Craighill bends has been 97 per cent completed. This was new work. Dredging began July 5, 1905, and has resulted in a channel 600 feet wide and 35 feet deep, widened to some extent at the bends and entrances from Fort McHenry to deep water in Chesapeake Bay, and in a 600 feet wide by 35 feet deep channel in the section opposite York Spit. The anchorage basin in the Fort McHenry division has been completed. Work was begun June 13, 1911, on the widening of the Cutoff-Brewerton and Cutoff-Craighill bends, and it is about 97 per cent completed. It is expected that the project will be entirely finished in July, 1912.

The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality under improvement is 35 feet at mean low water. The mean range of tide is a little over 1 foot in the section near Baltimore and about 2½ feet in the York Spit section. The length of all improved sections of channel near Baltimore (which are contiguous) is about 20 miles; of that opposite York Spit 4½ miles. The head of navigation is Baltimore.

The amount expended on the existing project to the close of the fiscal year ending June 30, 1912, is $3,287,833.48, of which $211,883.07 was for maintenance. Receipts from sales of old condemned property amounted to $15.

The tonnage movement of the port has been as follows:

Fiscal year ending June 30—	Short tons.	Fiscal year ending June 30—Continued—	Short tons.
1889	3,632,179	1901	9,021,619
1890	4,745,344	1902	8,433,454
1891	5,034,925	1903	8,664,820
1892	5,850,927	1904	8,214,350
1893	5,160,037	1905	8,411,999
1894	5,323,300	1906	9,270,349
1895	5,370,360	1907	9,461,987
1896	6,007,561	1908	9,453,958
1897	7,682,294	1909	8,328,626
1898	8,220,134	1910	9,425,046
1899	7,664,854	1911	9,806,421
1900	8,894,570	1911 (calendar year)	10,123,355

The statistics of the port for the past fiscal year are illustrated briefly by the following statement:

Value of commerce; coal, coke, grain, iron, oysters, lumber, etc.	$200,908,059.00
Dutiable imports have decreased	3,022,151.00
Free imports have decreased	972,749.00
Domestic exports have increased	20,398,400.00
Tonnage, foreign and coastwise, has increased (short tons)	316,934.00
Duties collected have decreased	623,863.82
Duties on merchandise in bond have decreased	14,613.06
Duties on merchandise in bond, with and without appraisement, have decreased	676,436.06

The project has had the effect of putting Baltimore on the same plane with other ports having the same facilities.

July 1, 1911, balance unexpended		$428,902.44
Received from sale of condemned property		15.00
		428,917.44
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$203,200.85	
For maintenance of improvement	28,764.65	
		231,965.50
July 1, 1912, balance unexpended		196,951.94
July 1, 1912, outstanding liabilities		2,238.97
July 1, 1912, balance available		194,712.97
Amount appropriated by river and harbor act approved July 25, 1912		50,000.00
Amount available for fiscal year ending June 30, 1913		244,712.97
July 1, 1912, amount covered by uncompleted contracts		29,689.20

(See Appendix J 1.)

2. *Channel to Curtis Bay, in Patapsco River, Baltimore Harbor, Md.*—There was a controlling depth of 20 feet at mean low water in 1893, when the first improvement was undertaken by the United States. Curtis Bay is a tidal estuary of Patapsco River and is about 6 miles southeast of Baltimore Harbor. It is also the mouth of Curtis Creek, which has its source in Anne Arundel County, Md. Its general direction of flow is northeast. The length of the section of channel included in the project is 2⅛ miles. The distance of its lower end from the mouth of the bay is 1 mile.

The original project was dated July 15, 1892, and was for a channel 27 feet deep at mean low water and a bottom width of 150 feet, at an estimated cost of $85,000. Forty thousand dollars of the estimate was appropriated, and with this total expenditure the channel was first made 25 feet deep for the project width and then dredged to 27 feet deep for a width of 70 feet in the axis of the 150-foot channel. The project was never completed.

The existing project was adopted by the river and harbor act approved June 13, 1902, and is for deepening the channel to 30 feet and widening it to 250 feet. The estimated cost was $196,000.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entire work [1]	House	102	Fifty-first	Second	1891	1243
Do.[1]	Senate	118	Fifty-sixth	do	1901	1394

[1] No maps.

No modification has been made in the existing project. Work under contract for maintenance was in progress during the fiscal year which resulted in the restoration of the channel to project dimensions. The amount expended on the existing project to the close of the fiscal year ending June 30, 1912, was $215,000, of which $22,316.64 was for maintenance. The project was completed November 30, 1903, and operations since that date have been for maintenance. The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality under improvement is 30 feet at mean low water. The mean range of tide is a little over 1 foot. The length of the improved section is 2¼ miles extending from the main ship channel leading to Baltimore to the old Sugar Refinery Wharf in South Baltimore. The head of navigation is 5⅛ miles above the portion under improvement.

This bay is in the collection district of Baltimore and the statistics are included in the report for that harbor. The improvement has had the effect of putting this port on the same plane with other ports having the same facilities. No funds are asked for the fiscal year ending June 30, 1914, as $5,000 appropriated by the act of February 27, 1911, are in hand for maintenance, which is being held until the deterioration of the channel renders it desirable to expend it.

July 1, 1911, balance unexpended	$14,751.36
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	9,751.36
July 1, 1912, balance unexpended	5,000.00

(See Appendix J 2.)

3. Harbor of Southwest Baltimore (Spring Garden), Md.—No work was done by the United States before the existing project, but the city of Baltimore dredged a channel from the main ship channel to the foot of Eutaw Street, which had a controlling depth of 15 feet at mean low water. Southwest Baltimore, or Spring Garden, is a tidal estuary of Patapsco River and is on the south side of Baltimore city. The length of the section of the channel included in the project is 4 miles. Its lower end extends about 2½ miles below the harbor. This harbor is 2 miles long by an average of one-half mile wide. Under date of March 7, 1896, an estimate of $314,000 was submitted for a channel 27 feet deep, 100 feet wide on the bottom, with side slopes of 1 on 3, from the main ship channel near Fort McHenry to the foot of Eutaw Street, with a turning basin 400 feet by 400 feet near the upper end. This was adopted June 3, 1896, and is the original project. There have been no modifications and it is therefore the existing project. This channel was dredged in very soft material, where silt has been slowly accumulating for many years. The cost of maintenance for a number of years was large, but the side slopes have flattened considerably, and it is thought that the cost of maintenance will be reduced. On June 3, 1896, $5,000 was appropriated, but it was deemed inexpedient to start the work with that small sum. June 13, 1902, $88,000 was appropriated and authority granted to enter into contracts for the completion of the work. A continuing contract was made for the completion of the project and it was completed April 4, 1905. The report of survey is printed in House Document No. 304, Fifty-fourth Congress, first session, and on page 1006 of the Annual Report of the Chief of Engineers for 1896. No maps were printed. Work under contract for maintenance was in progress during the fiscal year which resulted in the restoration of the channel to project dimensions. The amount expended on the existing project to the close of the fiscal year ending June 30, 1912, was $380,776.66, of which $66,776.66 was for maintenance.

The project was completed April 4, 1905, and operations since that date have been for maintenance. The maximum draft that can be carried June 30, 1912, at mean low water over the shoalest part of the locality under improvement is 27 feet. The average rise of tide is a little over 1 foot. The length of the improved section is 4 miles, and it extends about 2½ miles below the mouth of the harbor. The improvement extends to the foot of Eutaw Street, Baltimore, which is the head of navigation.

This harbor is in the collection district of Baltimore, and the statistics are included in the report for that harbor. The improvement has had the effect of putting this port on the same plane with other ports having the same facilities. No funds are asked for the fiscal year ending June 30, 1914, as there is a balance on hand for maintenance, which is being held until the deterioration of the channel renders its expenditure desirable.

July 1, 1911, balance unexpended	$24,296.07
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	6,572.73
July 1, 1912, balance unexpended	17,723.34

(See Appendix J 3.)

4. Elk and Little Elk Rivers, Md.—Before improvements were commenced there was practically no navigation above Cedar Point, 15 miles from the mouth. The Elk River rises in Chester County, Pa., and empties into the head of Chesapeake Bay, a distance of about 35 miles. About 15 miles from its mouth it is joined by the Little Elk, which also rises in Chester County, Pa., and has a length of about 12 miles. The general direction is southerly. The length of the portions included in the project are about 1,200 feet and 2,000 feet, respectively, in the Elk and Little Elk, the lower end of the two portions being at the junction of the two rivers and about 15 miles from the mouth of the Elk. The original project, dated June 23, 1874, was for a channel 6 feet deep at low water, or 8 feet at high water, from Cedar Point to Elkton, the head of navigation, and in the Little Elk as far as Bennetts Wharf. Such a channel was estimated to cost $36,000 if 75 feet wide, and about $25,000 if 50 feet wide, cheap dikes being required for regulating the banks and to provide a place behind which to deposit the material dredged from the shoals. The first work was done in 1874, when $5,000 was expended in building a dike and dredging to a width of 25 feet and a depth of 6 feet at mean low water in front of it and for about 300 feet below. Two years later the channel was made 40 feet wide from the bridge at Elkton to about one-half mile below. In 1884 a channel was completed 80 feet wide through the bar near the mouth of the Little Elk River and 70 feet wide thence to the bridge at Elkton, the depth being 7 feet at mean low water. In 1893 a channel 100 feet wide and 8 feet deep from deep water below Cedar Point to the bridge at Elkton was completed.

The channel had shoaled, and in a report on a survey made in 1899 it was proposed to restore the channel to 8 feet depth at mean low water and 100 feet wide from deep water below Cedar Point to the bridge at Elkton, at an estimated cost of $16,665, with an annual cost of $2,500 for maintenance. The river and harbor act of June 13, 1902, adopted this project and appropriated $16,665 for the work. This appropriation was practically expended in dredging in the fiscal year ending June 30, 1903. The project width of 100 feet could not be made, as the river was found to have shoaled very much since the survey in 1899, on which the appropriation was based.

A project adopted by the river and harbor act of March 2, 1907, was for a channel 6 feet deep at mean low water and 100 feet wide from Elkton to Cedar Point, at an estimated cost of $16,802.77. The act appropriated $18,803 for its completion and maintenance. A contract was entered into and the project completed in March, 1908. Extensive shoaling followed, and it was doubtful whether the project could be maintained without annual dredging to an extent much greater than was anticipated. The expenditure on the original and subsequent projects has amounted to $103,946.59, of which $24,342.35 was for maintenance.

The existing project, adopted by the river and harbor act of July 25, 1912, is in accordance with plan printed in House Document No. 770, Sixty-second Congress, second session, and is for a channel 7 feet deep at mean low water and 80 feet wide from the junction of the Elk and Little Elk Rivers for a distance of about 1,200 feet up the former stream and 2,000 feet up the latter, at an estimated cost of

$6,060. The sum of $4,040 was appropriated by the act for the completion of the improvement upon condition that local interests provide the remaining $2,020.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Elkton, Md., to Partridges Wharf					1873 [1]	815
Cedar Point to Elkton and Cedar Point to Bennetts Wharf.					1874 [1] (Pt. II)	81-82
Cedar Point to Elkton					1890 [1]	966
Elk River for 14,000 feet down from Elkton, Little Elk River 2,000 feet up from mouth.	House	105	Fifty-sixth	First	1900 [1]	1668
Elkton to Cedar Point [2]	do	738	Fifty-ninth	do	1906	214
Elk River—Elkton to Cedar Point, Little Elk 2,000 feet above mouth.[2]	do	770	Sixty-second	Second		

[1] No maps.

[2] Contains maps.

No modification has been made in the existing project. Work under project adopted March 2, 1907, under a contract for maintenance, was in progress during the fiscal year, which resulted in the restoration of the channel to project dimensions, but by January, 1912, it had again extensively shoaled. A report on survey required by the river and harbor act of February 27, 1911, was made January 17, 1912, and is printed in House Document No. 770, Sixty-second Congress, second session.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the river was 4 feet. The mean range of tide is 2 feet. The stream is navigable to the extent indicated as far as Elkton, Md. The portion under improvement from Elkton to Cedar Point is about 1 mile in length.

The commerce of the river for the year ending December 31, 1911, is reported to be 40,408 short tons, consisting of fertilizers, general merchandise, pulp wood, and canned tomatoes, valued at $163,354.17. Water rates have not been affected; rail rates have been reduced.

July 1, 1911, balance unexpended	$9,906.50
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	9,885.09
July 25, 1912, balance unexpended	21.41
Amount appropriated by river and harbor act, approved July 25, 1912	4,040.00
Amount available for fiscal year ending June 30, 1913	4,061.41

(See Appendix J 4.)

5. *Susquehanna River above and below Havre de Grace, Md.*—The original governing depth was 5 feet at mean low water. The channel above Havre de Grace was narrow and subject to ice gorges. The river rises in the southern part of New York, flows in a general southerly direction, and empties into the head of Chesapeake Bay.

Its length is about 400 miles. The length of the section included in the project is about 5½ miles, and the project extends about 5 miles below the mouth of the river. The original project is dated February 22, 1853, and was for a channel 12 feet deep and 100 feet wide, at an estimated cost of $59,000. Improvements have been in progress since 1853, and up to August 2, 1882, when the existing project was adopted, $97,390 had been expended upon them.

The existing project is to give a channel 200 feet wide and 15 feet deep at mean low water below Havre de Grace, and to remove the shoal opposite Watsons Island (which is above Havre de Grace) to a depth of 8 feet at the same stage of tide, at an estimated cost of $168,000.

Owing to shoaling which had taken place over the unimproved section of the project and the completed portion as well, since its adoption, the estimated cost of the project was increased December 2, 1911, to $200,750. Reports on examination and survey are to be found in House Document No. 396, Sixty-second Congress, second session (no maps), and on page 837, Annual Report of the Chief of Engineers for 1882 (no maps). There have been no modifications made in the existing project since its adoption. Work under contracts for improvement was in progress during the fiscal year, which resulted in extending the project 6,012 feet downstream and in restoring that portion previously dredged for 7,250 feet.

The amount expended on the present project to June 30, 1912, is $167,968.12, of which $18,480 was for maintenance. Work to June 30, 1912, has resulted in completing about three-fourths of the approved project, including the removal of the shoal opposite Watsons Island, to a depth of 8 feet. The maximum draft that can be carried June 30, 1912, at mean low water over the shoalest part of the channel under improvement is 12 feet. The mean range of tide is 2½ feet. The lengths of all improved sections of the river, including its prolongation to the head of Spesutie Island, aggregate about 5¼ miles. The stream is navigable, in fact, to Port Deposit, Md., which is about 5 miles above the mouth of the river. The stream has been used for rafting and logging as far up as Williamsport, Pa.

The commerce of the river is reported to be as follows: 1905, 151,528; 1906, 82,673; 1907, 95,437; 1908, 37,927; 1910, 192,675; and for the year ending December 31, 1911, 352,335 short tons, consisting of canned goods, fertilizers, fish, ice, general merchandise, salt, stone, etc., valued at $2,864,688.

The improvement has made no appreciable difference in freight rates. Funds asked for will be applied to completing the project.

July 1, 1911, balance unexpended		$54,160.24
June 30, 1912, amount unexpended during fiscal year:		
For works of improvement	$35,648.36	
For maintenance of improvement	18,480.00	
		54,128.36
July 1, 1912, balance unexpended		31.88
Amount (estimated) required to be appropriated for completion of existing project		[1] 51,230.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[1] 51,230.00

(See Appendix J 5.)

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[1] Exclusive of the balance unexpended July 1, 1912.

6. Harbors at Rockhall, Queenstown, Claiborne, and Cambridge, and Chester, Choptank, Warwick, Wicomico, Pocomoke, La Trappe, and Manokin Rivers, and Tyaskin Creek, Md.—(a) Rockhall Harbor and inner harbor at Rockhall.—In 1894 the controlling depth at Rockhall Harbor was 5 feet at mean low water. The general dimensions of the harbor are about one-third mile wide by three-fourths mile long. It is located on the eastern shore of Chesapeake Bay, about 25 miles southeast of Baltimore Harbor.

With an appropriation of $16,600, made June 3, 1896 (the first for this work), a project was carried out in 1897–98 for dredging a cut 80 feet wide and 10 feet deep at mean low water from the 10-foot curve in Swan Creek Inlet to the 10-foot depth in Chesapeake Bay, and a channel 100 feet wide and 10 feet deep from that depth in Swan Creek Inlet to the old pier at Rockhall. A turning basin, embracing the old and new piers, was also dredged.

In accordance with the river and harbor act of March 3, 1899, an examination was made of Rockhall Harbor and the inner harbor at Rockhall. The project then proposed was to dredge a channel 12 feet deep and 150 feet wide from Chesapeake Bay to Swan Creek Inlet, across Swan Point Bar, and 12 feet deep and 150 feet wide from Swan Creek Inlet to the wharf at Rockhall, at a cost estimated in 1899 to be $43,065, with $9,208 every two years for maintenance.

The river and harbor act of June 13, 1902, adopted this project, which is the existing one. The unit price of dredging exceeded that assumed in the original estimate, and the estimated cost of the project was therefore increased May 13, 1907, to $60,386.81, and further increased April 9, 1912, to $71,196.81, due to the broadening of the outer bar, which prevented completion of the project under the previous increase. Lack of wharf facilities and use of the inner harbor render it undesirable for the United States to continue work in that section of the improvement, and it is recommended that it be dropped. Recommendation is also made to modify the project for the section embracing the channel through the outer bar by reducing it from 12 feet to 10 feet, the reasons for which are the proximity of a deeper channel to the southward, the large cost of maintenance, and the comparatively small number of vessels which would have to use it.

Report on an examination and survey will be found in House Document No. 99, Fifty-sixth Congress, first session (no maps), and in the Annual Report of the Chief of Engineers for 1900, pages 1670–1672. No modifications in the existing project have been made.

Work under contracts for improvement and maintenance was in progress during the fiscal year, and resulted in extending the project from the 12-foot contour in Swan Creek Inlet westward for a distance of 4,360 feet and in restoring about 700 feet of the portion previously dredged. The amount expended on the present project to June 30, 1912, is $64,831.64, of which $4,484.91 was for maintenance. Work to June 30, 1912, has resulted in completing about six-sevenths of the approved project.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel across Swan Point Bar, is 8 feet and in the inner harbor 12 feet. The average range of tide is about 1 foot. The length of all improved sections of the channel is about 2¼ miles. The harbor is a bay making in from Chesapeake Bay, and is navigable in fact to Rockhall Pier, which is about one-fourth mile above the mouth of Rockhall Harbor.

The commerce for the fiscal year 1909 was 19,827 short tons, while for the year ending December 31, 1911, it is reported to be 8,570 short tons, consisting of canned goods, coal, fertilizers, fish, lumber, oysters, and wheat, valued at $194,350.

It is stated that the improvement has had no appreciable effect on freight rates. The funds asked for will be applied to completing the project.

July 1, 1911, balance unexpended		$23, 593. 98
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$19, 606. 53	
For maintenance of improvement	3, 947. 37	
		23, 553. 90
July 1, 1912, balance unexpended		40. 08
July 1, 1912, outstanding liabilities		14. 33
July 1, 1912, balance available		25. 75
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		5, 000. 00
Amount available for fiscal year ending June 30, 1913		5, 025. 75
Amount (estimated) required to be appropriated for completion of existing project		[1] 10, 810. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		([2])

(*b*) *Queenstown Harbor.*—Before 1871 the controlling depth in this harbor was 6 feet at mean low water. The general dimensions of the harbor are about one-half mile square. It is located on the eastern shore of Chesapeake Bay, on Chester River, about 35 miles southeast of Baltimore Harbor. Between 1871 and 1880 it was improved under a project dated January 2, 1871, and a channel 100 feet wide at bottom and 8 feet deep at mean low water was made. In 1897, with $5,000 appropriated for continuing the improvement, a channel was dredged to 8½ feet at mean low water and 100 feet wide from Chester River to the inner harbor, and in 1900 a shoal extending from a point about 138 feet above the lower light down for a distance of 950 feet was dredged to a depth of 8 feet and a width of 80 feet, the total amount expended for this work being $19,000.

The existing project, adopted in the river and harbor act of June 13, 1902, provided for increasing the dimensions of the channel to 10 feet deep and 200 feet wide, at an estimated cost of $23,100. The unit price of dredging exceeded that in the original estimate, and the cost of the project was therefore increased May 13, 1907, to $25,886.35. Report on the examination and survey will be found in House Document No. 92, Fifty-sixth Congress, first session, with map, and in the Annual Report of the Chief of Engineers for 1900 pages 1673–1676.

No modification in the existing project has been made.

The amount expended on the present project to June 30, 1912, is $32,530.45, of which $6,672.18 was for maintenance. Work to June 30, 1912, has resulted in completing the project and its restoration to project dimensions. The maximum draft that could be carried June

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[1] Exclusive of amount available for fiscal year 1913.

[2] See consolidated money statement on page 352.

30, 1912, at mean low water over the shoalest part of the locality under improvement was 9 feet. The mean range of tide is about 2 feet. The improved portion of the channel is about 1 mile long. The harbor is a bay making from the Chester River, and is navigable, in fact, to Queenstown, the head of navigation, which is about one-half mile above the mouth of the harbor. The commerce of the harbor is reported to be as follows: 1900, 12,373; 1901, 11,328; 1902, 18,769; 1903 (only partial statistics could be obtained), 3,889; 1904, 19,144; 1905, 19,421; 1906, 19,808; 1907, 20,202; 1908, 22,220; 1910, 22,439; and for the year ending December 31, 1911, 28,142 short tons, consisting of agricultural products, canned goods, coal, corn, fish and oysters, tomatoes, wheat, and general merchandise, valued at $1,389,460.

The improvement has made no perceptible difference in freight rates. The funds asked for will be expended in restoring the channel to project dimensions.

July 1, 1911, balance unexpended		$3,140.70
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$332.13	
For maintenance of improvement	2,781.00	
		3,113.13
July 1. 1912, balance unexpended		27.57
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		5,000.00
Amount available for fiscal year ending June 30, 1913		5,027.57
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		(1)

(*c*) *Claiborne Harbor, Md.*—Before 1902 the controlling depth in this harbor was 9 feet at mean low water. The general dimensions of the harbor are about one-half mile square. It is located on the eastern side of Eastern Bay, a tributary of the Chesapeake Bay, about 42 miles southeast of Baltimore Harbor and 6 miles east of Bloody Point Lighthouse. No improvement had ever been made there by the United States previous to the existing project.

The act of June 13, 1902, adopted the existing project, which provides for dredging a channel 12 feet deep at mean low water and 300 feet wide from the 12-foot contour in Eastern Bay to the railroad pier in the harbor, a distance of about 1,900 feet, and thence shoreward along the south side of the pier to a width of 195 feet for a length of 500 feet, at an estimated cost of $17,490, and a further sum of $2,500 for an extension of the existing jetty should it be found necessary.

Owing to the facts that the unit price of dredging has exceeded that in the original estimate and the small appropriations, the work has been prolonged and the total cost of the project was increased May 13, 1907, to $27,408.30. This sum, increased by the $2,500 estimated as required for jetty extension, makes the total amount estimated to complete the existing project $29,908.30.

The jetty extension was deemed necesary to preserve the north side of the channel to project dimensions from the current from East-

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[1] See consolidated money statement on page 352.

ern Bay around Tilghmans Point, which, passing over the sand flats, carries material into the dredged channel at the outer end of the present jetty. The scour has been considerable in the last few years and has eroded Tilghmans Point, which formerly acted as a deflector, to such an extent as to render jetty extension necesary for the maintenance of the channel.

Report on the examination and survey upon which the project is based will be found in House Document No. 81, Fifty-sixth Congress, first session, with map, and in the Annual Report of the Chief of Engineers for 1900, pages 1677–1681. No modification in the existing project has been made.

Work under contracts for maintenance and jetty construction was in progress during the year, and resulted in restoring the channel to project dimensions, and completing the jetty.

The total amount expended on the existing project to June 30, 1912, is $49,610.21, of which $19,736.56 was for maintenance. Work to June 30, 1912, has resulted in completing the project and the restoration of the channel to project dimensions.

The maximum draft that can be carried June 30, 1912, at mean low water over the shoalest part of the channel is 12 feet. The mean range of tide is about 2 feet. The length of all improved sections is about 2,400 feet.

Claiborne is at the head of navigation in Claiborne Harbor, and is the western terminus of the Baltimore, Chesapeake & Atlantic Railway. It is about one-half mile from the mouth of the harbor.

The commerce of the harbor is reported to be as follows: 1903, 89,549; 1904, 90,435; 1905, 93,603; 1906, 91,957; 1907, 93,794; 1908, 103,173; 1909, 104,201; 1910, 105,249; and for the year ending December 31, 1911, 105,511 short tons, consisting of agricultural products, canned goods, coal, general merchandise, and lumber, valued at $8,966,291.

The improvement has made no appreciable difference in freight rates. The funds asked for will be applied to maintaining the completed channel.

July 1, 1911, balance unexpended		$7,485.92
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$3,350.04	
For maintenance of improvement	4,100.00	
		7,450.04
July 1, 1912, balance unexpended		35.88
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		3,000.00
Amount available for fiscal year ending June 30, 1913		3,035.88
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		([1])

(*d*) *Cambridge Harbor.*—In 1870, before operations were commenced, there was a controlling depth of 4 feet. The general dimensions of the harbor are about three-fourths mile long by one-fourth mile wide. It is located on the eastern side of Choptank River about 20 miles above its mouth, and is distant southeastwardly from Baltimore Harbor about 65 miles.

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[1] See consolidated money statement on page 352.

The improvement of the harbor was commenced in 1871 with a project submitted in March of that year for an entrance way of 100 feet in width and to provide sufficient harbor accommodations of a depth of 10 feet at mean low water. The estimated cost was $36,000. The sum of $10,000 was appropriated March 3, 1871, and work begun. On this and succeeding projects $50,237 was expended to June 30, 1896, resulting in a channel 150 feet wide and 12 feet deep at mean low water from that depth in the Choptank River to the railroad wharf, a distance of nearly a mile. The inner harbor below the bridge had been dredged over its whole irregular area to a depth of 10 feet, and the part of the harbor above the bridge for a distance of 750 feet had been dredged to a depth of 8 feet and a width of 215 feet.

The existing project was adopted June 13, 1902, and is for a 12-foot low-water channel 150 feet wide from the 12-foot curve in the Choptank River to a point 500 feet outside the Baltimore, Chesapeake & Atlantic Railway Co.'s steamboat wharf, and from this point gradually widening to the harbor line at the wharf; from the steamboat wharf to Mill wharf to increase the width an average of 200 feet, with a depth of 8 feet, making an anchorage basin; increasing the width of the lower harbor 40 feet on the north side and widening the upper harbor an average of 360 feet along the channel already dredged to a depth of 8 feet. The estimated cost of the project was $8,120. The estimate of cost of the project was increased May 13, 1907, to $13,858.25. Report on the examination and survey upon which the existing project is based will be found in House Document No. 119, Fifty-fourth Congress, second session (no maps); in House Document No. 560, Sixty-first Congress, second session, with map; and in the Annual Report of the Chief of Engineers for 1897, pages 1296–1297. No modification in the existing project has been made. Work under contract for maintenance was in progress during the year, and resulted in restoring the channel to project dimensions.

The amount expended on the existing project to June 30, 1912, is $16,454.22, of which $5,370.09 was for maintenance. To June 30, 1912, the project has been completed and the channel restored to project dimensions.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel below the bridge was 12 feet and 8 feet above. The mean range of tide is about 1.7 feet. The length of the improved sections of this harbor is about 1 mile. Cambridge is the head of navigation, to which point the harbor is navigable in fact.

The commerce is reported to be as follows: For the year ended December 31, 1909, 115,195; 1910, 116,343; and in 1911, 122,176 short tons, consisting of agricultural products, canned goods, coal, fish and oysters, and general merchandise, valued at $10,955,859.

The improvement has made no appreciable difference in freight rates.

July 1, 1911, balance unexpended		$2,927.13
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$356.00	
For maintenance of improvement	2,553.92	
		2,909.92
July 1, 1912, balance unexpended		17.21

(*e*) *Chester River, Md., from Crumpton to Jones Landing.*—Before operations were undertaken on this part of the river vessels at low tide drawing 6 feet of water could reach Crumpton, 33 miles above the mouth, and from that point to Jones Landing, 6¼ miles, the controlling depth was 3 feet. Chester River rises in Kent County, Del., flows in a generally southwesterly direction and empties into the Chesapeake Bay. Its total length is about 50 miles. The length of the section included in the project is 6¼ miles, and its lower end is 33 miles above the mouth of the river.

Before the adoption of the present project there had been appropriated for this river $41,000, of which $2,958.54 was carried to the surplus fund on June 30, 1909, all of which was for work on parts of the river not covered by the existing project.

The existing project for improvement, adopted by the river and harbor act of September 19, 1890, is for a 6-foot mean low-water channel from Crumpton to Jones Landing, 60 feet wide, at an estimated cost of $12,750, increased in 1896 to $14,250, and still later to $19,562.50. There has been but one project for this section of the river.

Report on examination and survey upon which existing project is based will be found in the Annual Report of the Chief of Engineers for 1890, pages 954–959, no maps. No modification has been made in the existing project since its adoption. Work under contract for maintenance was in progress during the year and resulted in restoring the channel to project dimensions.

The amount expended on the existing project to June 30, 1912, is $33,606.07, of which $15,946.59 is for maintenance.

To June 30, 1912, the project has been completed and the channel maintained to project dimensions.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the river was 6 feet. The mean range of tide is 2.4 feet. The length of the improved section is 6¼ miles. The head of navigation is Millington, Md., about 2 miles above Jones Landing.

The commerce of the river is reported to be as follows: 1906, 48,199; 1907, 49,162; 1908, 54,078; 1909, 54,618; 1910, 54,616; and for the year ending December 31, 1911, 68,709 short tons, consisting of agricultural products, canned goods, coal, fertilizers, general merchandise, oysters, poultry, and live stock, valued at $4,256,820.

The improvement has made no appreciable difference in water rates, but railroad rates have been reduced.

July 1, 1911, balance unexpended	$2,629.14
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,602.43
July 1, 1912, balance unexpended	26.71

(*f*) *Choptank River, Md.*—Before improvements were begun in 1879 the depth of water in the channel between Denton and Greensboro varied from 2 to 8 feet. Navigation carried on by small sailing vessels extended to only 3 miles above Denton. Upon the remaining 5 miles to Greensboro all freight had to be transported upon scows. The headwaters of Choptank River are partly in Delaware and partly in Maryland in the section of country between Dover and

Centerville. Its general direction is southwest until near Cambridge, where it turns to the northwest and empties into Chesapeake Bay. Its total length is about 70 miles. The length of the section included in the project is about 8 miles, the lower end of which is about 38 miles above the mouth of the river. There has been but one project for this river.

The existing project for improvement, adopted by the river and harbor act of June 14, 1880, is for an 8-foot mean low-water channel 75 feet wide from Denton to Greensboro, at an estimated cost of $79,000.

Report on survey is to be found in the Annual Report of the Chief of Engineers for 1880, pages 634–636, no maps. No modification has been made in this project since its adoption. Work under contract for maintenance was in progress during the year and resulted in restoring the channel to project dimensions except for a short distance at Greensboro.

The amount expended on the existing project to June 30, 1912, was $88,942.78, of which $9,946.44 was for maintenance. To June 30, 1912, the project has been completed and the channel maintained to project dimensions except a short reach at Greensboro.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel under improvement was 7 feet. The mean range of tide is about 2 feet. The length of the improved section of the river from Denton to Greensboro is about 8 miles. Greensboro, located about 46 miles above the mouth of the river, is the head of navigation.

The commerce of the river is reported to be as follows: 1903, 208,367; 1904, 210,447; 1905, 212,725; 1906, 208,496; 1907, 212,661; 1908, 233,916; 1909, 234,920; 1910, 237,273; and for the year ending December 31, 1911, 252,502 short tons, consisting of agricultural products, canned goods, coal, general merchandise, fish and oysters, and grain, valued at $19,803,144.

The improvement has made no appreciable difference in water rates, but railroad rates have been reduced.

It is proposed to apply the funds asked for to maintenance.

July 1, 1912, balance unexpended		$4,361.30
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$240.91	
For maintenance of improvement	4,117.00	
		4,357.91
July 1, 1912, balance unexpended		3.39
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		3,000.00
Amount available for fiscal year ending June 30, 1913		3,003.39
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		(1)

(g) *Warwick River, Md.*—This river, formerly named Secretary Creek, is in Dorchester County, eastern shore of Maryland, and flows into the Choptank River, one of the largest tributaries of Chesapeake Bay. It is a small tidal basin 2 miles long, with no fresh water influx at the head, and was originally only 4 feet deep. The

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[1] See consolidated money statement on page 352.

length of the section included in the project embraces the entire river, and the lower end extends about one-half mile into the Choptank River.

The original project for the stream was adopted June 14, 1880, and provided for a channel 7 feet deep at mean low water and 75 feet wide. On this project about $12,000 was expended in the improvement of this river—$6,000 by the General Government and the remainder by private parties.

The existing project for improvement, adopted by the river and harbor act of July 13, 1892, provides for a channel 100 feet wide and 10 feet deep at mean low water from the 10-foot depth in Choptank River to Secretary Landing, at the head of the river, including a turning basin at the latter point, at an estimated cost of $18,600. The project was completed in July, 1903, but shoals formed rapidly.

Reports on examinations and surveys are to be found in the Annual Reports of the Chief of Engineers for 1880 and 1891, pages 636–637 and 1218–1221, respectively; no maps. No modification has been made in the existing project. Work under contract for maintenance was in progress during the year and resulted in restoring the channel to project dimensions.

The amount expended on the existing project to June 30, 1912, is $28,939.37, of which $12,898.55 was for maintenance.

To June 30, 1912, the project has been completed and the channel maintained to project dimensions.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel under improvement was 9½ feet. The average rise of tide is 2 feet. The length of the improved section of the river is about 1½ miles. The stream is navigable to Secretary Landing, which is the head of navigation.

The commerce of the river is reported to be as follows: 1903, 65,206; 1904, 65,858; 1905, 66,631; 1906, 60,027; 1907, 61,225; 1908, 67,346; 1909, 68,017; 1910, 68,595; and for the year ending December 31, 1911, 73,056 short tons, consisting of agricultural products, canned goods, coal, general merchandise, and oysters, valued at $3,719,623.

The improvement has made no appreciable difference in freight rates. Funds asked for will be applied to maintenance.

July 1, 1911, balance unexpended	$1,843.31
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,800.86
July 1, 1912, balance unexpended	42.45
July 1, 1912, outstanding liabilities	7.04
July 1, 1912, balance available	35.41
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	4,000.00
Amount available for fiscal year ending June 30, 1913	4,035.41
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

(*h*) *Wicomico River, Md.*—The river has its source in the northern part of Wicomico County, Md., is about 33 miles in length, and flows in a generally southwesterly direction, emptying into Monie

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[1] See consolidated money statement on page 352.

Bay, a tributary of Tangier Sound. The length of the particular section included in the project is 3.4 miles, and the distance of its lower end from the mouth of the river is about 20 miles. The portion of the river at and just below Salisbury has been under improvement by the United States since 1872, under project adopted June 10, 1872, which is the original project. Originally the navigable channel, with a minimum depth of 8 feet at mean low water, extended to a point within 2 miles of Salisbury. The extreme upper portion as far as the mill dam in the heart of the town was quite shoal and had an average depth of only 18 inches at low tide. Between 1872 and 1885 a channel 75 feet to nearly 100 feet wide and 7 feet deep at mean low water was dredged from deep water below to the drawbridge in the town at a cost to the Government of $50,000.

The existing project, based upon a survey of the river in 1889, was adopted September 19, 1890, and provides for a channel 9 feet deep at mean low water from the 9-foot depth near Fruitland wharf to the drawbridge at Salisbury, the width to be from 100 to 150 feet, at an estimated cost of $23,200. This project was modified by the river and harbor act of June 25, 1910, to include an extension of the channel to the Salisbury mill dam, a distance of about four-tenths mile, 9 feet deep, with varying widths, and a turning basin at the upper end 650 by 360 feet, at an increased cost of $24,000, with not to exceed $600 annually for maintenance, subject to certain requirements regarding necessary right of way and for the disposition of dredged material to be deeded to the United States free of cost, making the total estimated cost of the existing project $47,200.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Fruitland to drawbridge. Salisbury					1871 [1]	621
Whitehaven to Salisbury					1890 [1]	947
Mouth of river to Salisbury	House	[1] 908	Fifty-ninth	First		
Drawbridge to mill dam, Salisbury	do	[2] 569	Sixty-first	Second		

[1] No maps. [2] Contains map.

The existing project with all modifications incorporated, is for a channel 9 feet deep at mean low water from the 9-foot depth near Fruitland Wharf to the milldam at Salisbury; widths to be from 100 feet to 150 feet to the Salisbury drawbridge, and above that point with varying widths and a turning basin at the upper end 650 feet by 360 feet. Work under contracts for improvement and maintenance was in progress at the close of the year with the results that the extension to the milldam was about 6½ per cent completed and the channel restored to fairly good condition. Work under the act of June 25, 1910, was delayed until the latter part of the fiscal year, owing to the fact that certain requirements of the act regarding the necessary right of way and for the disposition of dredged material, to be deeded free of cost to the United States, had not been complied with.

The amount expended on the existing project to June 30, 1912, was $45,598.93, of which $22,316 was for maintenance.

To June 30, 1912, the project has been about one-half completed and the channel kept in fairly good condition.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel under improvement, was 8½ feet below the bridge and about 1 foot above. The average rise and fall of the tide is 3 feet. The length of all improved sections of the river aggregate 3.4 miles. Salisbury, the head of navigation, is about 23 miles above the mouth of the river.

The commerce of the river is reported to be as follows: 1903, 197,306; 1904, 199,279; 1905, 202,510; 1906, 198,451; 1907, 202,416; 1908, 222,657; 1909, 224,983; 1910, 227,428; and for the year ending December 31, 1911, 362,545 short tons, consisting of agricultural products, canned goods, coal, fertilizers, general merchandise, lumber, oysters, shingles, laths, and cord wood, valued at $18,729,665.

The improvement has made no appreciable difference in water rates; railroad rates have been reduced.

It is proposed to apply the funds asked for in restoring the channel to project dimensions.

July 1, 1911, balance unexpended		$32,000.00
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$82.93	
For maintenance of improvement	3,000.00	
		3,082.93
July 1, 1912, balance unexpended		28,917.07
July 1, 1912, outstanding liabilities		131.25
July 1, 1912, balance available		28,785.82
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		3,000.00
Amount available for fiscal year ending June 30, 1913		31,785.82
July 1, 1912, amount covered by uncompleted contracts		26,100.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		([1])

(*i*) *Pocomoke River, Md.*—The river has been under improvement by the General Government since 1878. Originally the upper portion of the river was very crooked and narrow at certain points and a depth of but from 4½ to 5 feet at mean low water could be obtained to Snow Hill, Md. It rises in Great Cypress Swamp partly in Delaware and partly in Maryland; it is about 50 miles in length, its general direction of flow is southwesterly and empties into Pocomoke Sound. The length of the particular section included in the project is about 4⅓ miles and its lower end is 24 miles above the mouth of the river. The original project is dated November 19, 1878, following an appropriation of $10,000 made in the river and harbor act of June 18, 1878, and was for a channel 7 feet deep with varying widths, between Snow Hill and Shad Landing. In 1879 and 1880, $12,500 was expended on work below Snow Hill, chiefly in the rectification of the channel and in giving increased width, the depth being 7 feet at mean low water. In 1888, with an appropriation of $8,000, a cut-off was made through the low neck of land forming four abrupt bends just below Snow Hill. At the close of these operations there was a channel not less than 80 feet wide and 7 feet deep between Snow Hill and Shad Landing, a distance of about 4¾ miles. The amount expended in this project was $20,500.

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[1] See consolidated money statement on page 352.

The existing project, adopted by the river and harbor act of June 3, 1896, is based upon a survey made in 1894–95, and is for dredging a channel between Snow Hill and Shad Landing to a depth of 9 feet at mean low water and a width from 100 to 130 feet, at an estimated cost of $14,000. Reports on examinations and surveys are to be found in House Document No. 344, Sixty-first Congress, second session (no maps), and in the Annual Report of the Chief of Engineers for 1879, and 1895, pages 505–510, and 1167 (contains map), respectively. No modification has been made in the existing project. Work under contract for maintenance was in progress during the year, and resulted in restoring the channel to project dimensions.

To the end of the fiscal year $21,674.42 has been expended on the present project, of which $7,403.69 was for maintenance. To June 30, 1912, the project has been completed (about 1904) and the channel maintained at project dimensions.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel under improvement was 9 feet. The mean range of tide is 2½ feet. The length of the improved portion of the river is about 4¾ miles. The head of navigation is about 2½ miles above Snow Hill to which point 30½ miles from the mouth, the stream is navigable in fact.

The commerce of the river is reported to be as follows: 1903, 245,568; 1904, 246,223; 1905, 67,165; 1906, 65,710; 1907, 67,024; 1908, 73,727; 1909, 74,459; 1910, 75,199; and for the year ending December 31, 1911, 78,644 short tons, consisting of agricultural products, bricks, canned goods, coal, general merchandise and lumber, valued at $5,188,888.

The improvement has made no appreciable difference in freight rates.

July 1, 1911, balance unexpended	$2,368.42
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,332.82
July 1, 1912, balance unexpended	35.60

(*j*) *La Trappe River, Md.*—This stream, formerly known as Dividing Creek, is a tributary of Choptank River. The controlling depth prior to 1893 was 4 feet, but was afterwards increased to 8 feet by dredging under private subscription. It is in the lower section of Talbot County, Md., and is a small tidal basin 3 miles long, with no fresh-water influx at its head. The length of the particular section included in the project embraces the whole river, its lower end being in the Choptank River.

The original project, which is the existing one, was adopted by the river and harbor act of July 13, 1892, and is for a channel 150 feet wide and 11 feet deep at mean low water across the bar at the mouth and for a width of 75 feet and a depth of 8 feet inside the bar as far as Trappe Landing, with a turning basin at the latter point. at an estimated cost of $7,250, subsequently increased to $9,750. Reports on examinations and surveys are to be found in the Annual Report of the Chief of Engineers for 1889 and 1891, pages 920–921 and 1215–1218, respectively (no maps). No modification has been made in the existing project. Work under contract for maintenance was in progress during the year and resulted in restoring the channel to project dimensions.

The amount expended on the existing project to June 30, 1912, is $15,708.68. of which $7,644.81 was for maintenance. To June 30, 1912, the project has been completed and the channel maintained at project dimensions.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel was 11 feet across the bar and 8 feet inside. The mean range of tide is 2 feet. The length of all improved sections is about 3 miles. Trappe Landing is the head of navigation, to which point the stream is navigable in fact.

The commerce of the river is reported to be as follows: 1903, 11,466; 1904, 13,601; 1905, 13,848; 1906, 13,588; 1907, 13,859; 1908, 15,244; 1909, 15,394; 1910, 15,549; and for the year ending December 31. 1911, 18,530 short tons, consisting of agricultural products, cans, coal, canned goods, fertilizers, general merchandise, and lumber, valued at $1,115,099.

The improvement has made no appreciable difference in freight rates.

It is proposed to apply the funds asked for to maintenance.

July 1, 1911, balance unexpended	$1,578.95
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,455.79
July 1, 1912, balance unexpended	123.16
July 1, 1912, outstanding liabilities	107.75
July 1, 1912, balance available	15.41
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	3,015.41
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	([1])

(*k*) *Manokin River, Md.*—Before improvements were commenced in 1891 the depth of water at the mouth of the river at the so-called "Mud Flats" was between 1 and 2 feet at mean low water. These flats are about 2½ miles wide and made navigation impossible except at high water, thereby rendering the upper part of the river, which has a very fair depth and width, almost useless for extensive shipping purposes. The river has its source in Somerset County, Md., flows in a generally southwesterly direction, and empties into Tangier Sound. The length of the section included in the project is 2½ miles and its lower end is 5½ miles above the mouth of the river.

The original project, which is the existing one, was adopted by the river and harbor act of September 19, 1890, and is based upon a survey made in August and September, 1889. It provides for a channel 6 feet deep at mean low water and 100 feet wide from Locust Point to Sharps Point, a distance of about 2½ miles and embracing the section called the "Mud Flats," at an estimated cost of $30,000. Increased May 13, 1907, to $42,103.99. Reports on examinations and surveys are to be found in House Document No. 398, Sixty-second Congress, second session (no maps), and in the Annual Report of the Chief of Engineers for 1890, pages 959–964. No modifications have been made in the existing project. Work under contract for maintenance was in progress at the end of the year, and resulted in partially restoring the channel to project dimensions.

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[1] See consolidated money statement on page 352.

The creation and maintenance of a channel across the mud flats at the mouth of the river is a work of some difficulty and uncertainty under the method adopted, which was originally considered as tentative only and the best that the commercial importance of the project would justify. Funds have not been available for adequate maintenance and the channel has always deteriorated rapidly.

The amount expended on the existing project to June 30, 1912, is $50,631.15, of which $17,843.10 was for maintenance and $2,000 additional was expended on the upper river, which is not included in the existing project. To June 30, 1912, the project has been completed and maintained in a generally good condition.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel was 5 feet. The average rise of tide is 2.6 feet. The length of the improved sections is about 2½ miles. Princess Anne is the head of navigation, to which point the river is navigable in fact. The length of all navigable portions of the river is 16 miles.

The commerce of the river for the year ending December 31, 1911, is reported to be 4,805 short tons, consisting of canned goods, coal, fertilizers, baled grass, lumber, and oysters, valued at $81,357.

The improvement has made no appreciable difference in freight rates.

July 1, 1911, balance unexpended		$5, 191. 29
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$419. 98	
For maintenance of improvement	839. 97	
		1, 259. 95
July 1, 1912, balance unexpended		3, 931. 34
July 1, 1912, outstanding liabilities		162. 75
July 1, 1912, balance available		3, 768. 59
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		5, 000. 00
Amount available for fiscal year ending June 30, 1913		8, 768. 59
July 1, 1912, amount covered by uncompleted contracts		3, 552. 64

(*k*) *Tyaskin Creek, Md.*—This stream is also known as Wetipquin Creek or River. It has its source in Wicomico County, Md., and flows in a generally westerly direction and empties into the Nanticoke River, being about 5 miles in length. The particular section included in the project is about 3,500 feet long, and its lower end extends into the Nanticoke River. The controlling depth in the Creek was 8 feet, but on the bar at the mouth it was 3½ feet at mean low water. A survey was made in 1899. The original project was adopted by the river and harbor act of June 13, 1902, and was for a channel 9 feet deep at mean low water, with a width of 120 feet, at an estimated cost of $13,200. Under this project $10,158 was expended. The river and harbor act of March 2, 1907, appropriated $60,000 for improvement of rivers and harbors on the east shore of Chesapeake Bay, and $6,500 was allotted to complete this work, under a project based on a survey made in January, 1906, which provided for a channel 9 feet deep at mean low water, 120 feet wide, with a suitable turning basin at its upper end. This is the existing project and was estimated to cost $6,462.39. Reports on examinations and surveys will be found in House Document No. 109, Fifty-sixth Congress, first session, and House Document No. 682, Fifty-ninth Congress, first session, with maps, and in the Annual Report of the Chief of Engineers for 1900, pages 1681–1684. No modifications have been made in the existing project. Work under contract for maintenance was in progress during the year and resulted in restoring the channel to project dimensions, but some slight shoaling has since taken place.

The amount expended on the existing project to June 30, 1912, is $12,041.44, of which $5,902.81 was for maintenance. To June 30, 1912, the project has been completed and maintained in a fairly good condition.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the improvement was 8 feet. The average rise and fall of the tide is 3 feet. The length of the improved portion of the work is about 3,500 feet. The stream is navigable to Tyaskin, the head of navigation, which is about three-fourths mile from its mouth.

The commerce of the creek is reported to be as follows: 1903, 784; 1904, 796; 1905, 856; 1906, 945; 1907, 967; 1908, 1,064; 1909, 1,076; 1910, 1,087; and for the year ending December 31, 1911, 4,344 short tons, consisting of agricultural products, cans, canned goods, general merchandise, lumber, oysters and watermelons, valued at $162,333.

The improvement has made no appreciable difference in freight rates. Funds asked for will be applied to maintenance.

July 1, 1911, balance unexpended		$1,937.83
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$322.33	
For maintenance of improvement	1,578.00	
		1,900.33
July 1, 1912, balance unexpended		37.50
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		3,000.00
Amount available for fiscal year ending June 30, 1913		3,037.50
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		(1)

CONSOLIDATED.

July 1, 1911, balance unexpended		$89,057.97
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$24,710.85	
For maintenance of improvement	31,109.16	
		55,820.01

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[1] See consolidated money statement on this page.

July 1, 1912, balance unexpended	$33, 237. 96
July 1, 1912, outstanding liabilities	423. 12
July 1, 1912, balance available	32, 814. 84
Amount appropriated by river and harbor act approved July 25, 1912	34, 000. 00
Amount available for fiscal year ending June 30, 1913	66, 814. 84
July 1, 1912, amount covered by uncompleted contracts	29, 652. 64
Amount (estimated) required to be appropriated for completion of existing project	[1] 10, 810. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 33, 510. 00

(See Appendix J 6.)

7. *Corsica River, Md.*—This stream (formerly called Corsica Creek) is a tributary of Chester River, which it joins about 8 miles above Queenstown. It rises in Queen Anne County, Md., is about 10 miles long, and has a generally westerly course.

The improved section of the river is about 1¼ miles long and the distance of its lower end above the mouth of the river is about 4½ miles.

Formerly this river was only available to commerce to within about 1¼ miles of Centreville Landing.

The original project was adopted August 2, 1882, and provided for a channel 100 feet wide and 8 feet deep at mean low water from Hoopers Landing to Centreville and a turning basin at the town bridge. This channel was completed in 1889 at an expenditure of $30,000. No work has been done since that time.

The existing project, adopted by the river and harbor act of July 25, 1912, is for the restoration of the previously dredged channel, at an estimated cost of $5,368.

Reports on examinations and survey are to be found in Annual Report of Chief of Engineers for 1882, page 842 (no map), and in House Document No. 537, Sixty-first Congress, second session (with map).

No modification has been made in the existing project.

No work was done during the fiscal year, nor has any been done on the existing project.

The average rise and fall of tide is 2 feet.

The stream is navigable in fact to Centreville Landing, which is 6 miles above the mouth of the river.

Amount appropriated by river and harbor act approved July 25, 1912	$5, 368
Amount available for fiscal year 1913	5, 368

(See Appendix J 7.)

8. *Tuckahoe River, Md.*—This river (formerly called Tuckahoe Creek) rises in Queen Anne County, Md., flows in a generally southerly direction, and empties into the Choptank River about 8 miles below Denton. It is about 25 miles in length. The improved section of the river will be about 1 mile long, and the distance of its lower end about 9¾ miles above the mouth of the river.

This stream is crooked and shoal above Waymans Wharf, with a maximum depth of about 4 feet.

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[1] Exclusive of amount available for fiscal year 1913.

This is a new work, the existing project having been adopted by the river and harbor act of July 25, 1912, and is for a channel 8 feet deep at mean low water and 50 feet wide from Waymans Wharf for a distance of 1 mile to Rolphs Landing, and the removal of shoal below Waymans Wharf, at an estimated cost of $15,600.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to Hillsboro					1880 [1]	736
Waymans Wharf to Hillsboro					1885 [1]	908
Do					1889 [1]	921
Mouth to Hillsboro	House	[2] 1160	Sixtieth	Second		

[1] No map.

[2] Contains map.

No modification has been made in the existing project. No work was done during the fiscal year.

The average rise and fall of the tide is 2.3 feet.

The stream is navigable in fact to Hillsboro, which is 12¾ miles above the mouth of the river.

Amount appropriated by river and harbor act approved July 25, 1912	$15,600
Amount available for fiscal year 1913	15,600

(See Appendix J 8.)

9. Tilghman Island Harbor, Md.—This is a new work, and the controlling depth is 6½ feet. The general dimensions of the harbor are about 1,200 feet long by 600 feet wide. It is located on the easterly side of Tilghman Island, which is situated between Chesapeake Bay and Choptank River. It is about 60 miles southeastwardly from Baltimore Harbor.

The existing project was adopted by the river and harbor act of July 25, 1912, and is for an anchorage basin northerly from the steamboat wharf, 700 feet long, 300 feet wide, and 10 feet deep at mean low water, at an estimated cost of $7,820.

Report on examination and survey is to be found in House Document No. 400, Sixty-second Congress, second session, with map.

No modification has been made in the existing project. No work was done during the fiscal year, nor has any been done on the existing project. The average rise and fall of the tide is 1.4 feet. The length of the improved section of this harbor is 700 feet. Avalon is the head of navigation, to which point the harbor is navigable, in fact.

Amount appropriated by river and harbor act approved July 25, 1912	$7,820
Amount available for fiscal year 1913	7,820

(See Appendix J 9.)

10. Tred Avon River, Md.—This stream, formerly called Treadhaven Creek, is a tributary of the Choptank River, which it joins about 10 miles from its mouth. It rises in Talbot County, Maryland, is about 10 miles long, and has a generally southerly course. The improved section of the river is about 3 miles long, and the distance of its lower end above the mouth of the river is 7 miles.

Before operations were begun in 1880 there was a controlling depth of less than 7 feet to Easton Point. With $6,000 appropriated in 1880 and 1881, a channel was dredged from Peach Blossom Creek to Easton Point, 8 feet deep at mean low water, and 150 feet wide, with a turning basin at the latter point. No work has been done since that time.

The existing project, adopted by the river and harbor act of July 25, 1912, is to restore the channel formerly dredged from Peach Blossom Creek to Easton Point to 8 feet deep at mean low water, and 150 feet wide, widening out at the upper end at an estimated cost of $9,200.

Reports on examinations and surveys are to be found in Annual Report of Chief of Engineers for 1880, page 638 (no map), and in House Document No. 339, Sixty-second Congress, second session (contains map).

No modification has been made in the existing project. No work was done during the fiscal year, nor has any been done on the existing project. The average rise and fall of tide is about 2 feet. The stream is navigable in fact to Easton Point, which is 10 miles above the mouth of the river.

Amount appropriated by river and harbor act approved July 25, 1912	$9,200
Amount available for fiscal year ending June 30, 1913	9,200

(See Appendix J 10.)

11. Slaughter Creek, Md.—This stream is a tributary of the Little Choptank River, which it joins about 5 miles from the mouth. It rises in Dorchester County, Maryland, flows in a generally northerly direction and is about 8 miles long. The improved section of the creek will be about one-third mile in length, its lower end extending about 900 feet into the Little Choptank River.

Steamboat navigation, drawing 7 feet, had been carried on here for a number of years, but owing to shoaling at the mouth of the creek this service was withdrawn in April, 1911.

This is a new work, the existing project having been adopted by the river and harbor act of July 25, 1912, and is for a channel 7 feet deep at mean low water, and 100 feet wide, through the bar at the mouth, at an estimated cost of $4,140.

Reports on examination and surveys are to be found in Annual Report of Chief of Engineers for 1880, page 739 (no map), and in House Document No. 87, Sixty-second Congress, first session (no map).

No modification has been made in the existing project. No work was done during the fiscal year, nor has any been done on the existing project. The average rise and fall of the tide is about 1.5 feet. The stream is navigable in fact to Taylor Island Wharf, which is 3 miles above the mouth of the creek.

Amount appropriated by river and harbor act approved July 25, 1912	$4,140
Amount available for fiscal year ending June 30, 1913	4,140

(See Appendix J 11.)

12. Nanticoke River, Del. and Md.—The Nanticoke River is a tidal stream, its headwaters consisting of numerous branches rising mainly in the northern section of Sussex County, Del. The river flows in a southwesterly direction into Tangier Sound, Chesapeake Bay, and the interests for the improvement of the river center at Seaford. It is about 50 miles in length, and flows in a generally southwesterly direction. The length of the particular section included in the project is about 2 miles and its lower end is 34 miles above the mouth of the river.

The river and harbor act of August 18, 1894, appropriated $5,000 for improving Broad Creek River, Del., a branch of Nanticoke River, and provided that as much of it as might be necessary should be used for the removal of the bar extending from the railroad bridge at Seaford toward the mouth of Nanticoke River. With this appropriation the channel was dredged where necessary to a width of 100 feet and a depth of 9 feet at mean low water from the south side of the railroad bridge at Seaford to a point 8,000 feet below. A previous appropriation for Nanticoke River in 1886 was, in accordance with the terms of the law, applied to Broad Creek River up to Laurel.

The existing project for the improvement of the Nanticoke River adopted by the river and harbor act of June 3, 1896, is based upon a survey made in 1895, and is for a channel 9 feet deep at mean low water and 100 feet wide, the width to be increased to about 150 feet at sharp turns of the channel, the improvements to be extended to within 100 feet of the county bridge, where the proposed channel is to widen out fan shaped, at an estimated cost of $13,000. This was modified by the river and harbor act of June 25, 1910, to allow a slight widening between the bridges at Seaford, at an additional cost of $2,860. Reports on examinations and surveys are to be found in House Document No. 323, Fifty-third Congress, third session, with map, and House Document No. 674, Sixty-first Congress, second session (no map) and in the Annual Report of the Chief of Engineers for 1895, pages 1165–1167. The existing project, with all modifications incorporated, is for a channel 9 feet deep at mean low water and 100 feet wide, the width to be increased to about 150 feet at sharp turns of the channel, to extend to within 100 feet of the county bridge, where the proposed channel is to widen out fan shaped. Work under contract for maintenance was in progress during the year, and resulted in restoring the channel to project dimensions.

The amount expended on the existing project to June 30, 1912, is $60,925.24, of which $17,109.93 was for maintenance. These figures include both the Nanticoke River proper and the Northwest Fork. To June 30, 1912, the project has been completed and maintained in good condition.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel was 9 feet. The mean range of tide is about 3.4 feet. The length of improved sections of the river is about 2 miles. Seaford, the head of navigation, is 36 miles from the mouth.

The commerce of the river is reported to be as follows: 1903, 119,038; 1904, 120,229; 1905, 121,769; 1906, 119,348; 1907, 121,733; 1909, 135,241; 1910, 136,569; and for the year ending December 31, 1911, 148,006 short tons, consisting of agricultural products, canned goods, cans, coal, corn, fertilizers, general merchandise, lumber, and oysters, valued at $8,383,730.

The improvement has made no appreciable difference in water rates; railroad rates have been reduced. Funds asked for will be expended for maintenance.

Northwest Fork of Nanticoke River (Marshyhope Creek) is about 30 miles in length. It rises in Kent County, Del., and flows past Federalsburg, Md. (the head of tide water), in a general southerly direction, through Dorchester County, Md., to its junction with Nanticoke River opposite Riverton. From its mouth to upper Brown's Wharf, the head of steamboat navigation, 5¼ miles below Federalsburg, the minimum depth of water was more than 6 feet. From this point, where the stream is 150 feet wide, to a point one-half mile below Federalsburg, it is about 100 feet wide. This reach contained numerous shoals of gravel, sand, and mud. The length of the section included in the project is 5¼ miles, and the distance of its lower end from the mouth of the river is 11¾ miles.

The existing project, which is the original one for this work, was adopted by the river and harbor act of June 25, 1910, and provides for a channel 60 feet wide at bottom and 6 feet deep at mean low water from upper Brown's wharf to within about one-half mile below the south boundary of the town of Federalsburg, with a turning basin at the upper end, at an estimated cost of $44,197.44, with $2,000 annually for maintenance after completion. Report on examination and survey is to be found in House Document No. 869, Sixtieth Congress, first session (no maps). No modification has been made in the existing project. Work under contract for completion was in progress during the year and resulted in completing the improvement.

The amount expended on this section of the river to June 30, 1912, is $44,197.44, of which $8,761.34 was for maintenance, and is included in the amount stated for Nanticoke River.

To June 30, 1912, the project had been completed and partially maintained. The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 5½ feet. The mean range of tide is 2.6 feet. The length of the improved section is about 5¼ miles. The head of navigation is within one-half mile of Federalsburg. The navigable portion of the stream is 16 miles in length. This project was not completed until near the close of the fiscal year; for this reason there was very little traffic on the river during the calendar year 1911. It was impracticable to determine the effect of improvement on freight rates. Funds asked for will be expended in maintenance.

July 1, 1911, balance unexpended		$37, 228. 24
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$26, 244. 48	
For maintenance of improvement	10, 949. 00	
		37, 193. 48
July 1, 1912, balance unexpended		34. 76
Amount appropriated by river and harbor act approved July 25, 1912		5, 000. 00
Amount available for fiscal year ending June 30, 1913		5, 034. 76
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 3, 600. 00

(See Appendix J 12.)

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[1] Exclusive of amount available for fiscal year 1913.

13. Broad Creek River, Del.—This is a tributary of the Nanticoke River, and in 1881 the controlling depth was 1½ feet. It rises near the Great Cypress Swamps in the southern part of Sussex County, Del.; its length is about 18 miles; its general direction of flow is westerly, and it empties into the Nanticoke River about 6 miles below Seaford, Del. The length of the particular section included in the project is 4 miles, and its lower end is about 3 miles above the mouth of the river. In 1889 a channel 6 feet deep at mean low water and 50 feet wide had been dredged under project dated June 14, 1880, from Bethel to Laurel at a cost of $35,000. The project of July 13, 1892, was for a channel 70 feet wide and 8 feet deep at mean low water between Bethel and Laurel at an estimated cost of $15,000. This project was completed and maintained to June 30, 1912, at a cost of $22,462.57, of which $7,462.57 was for maintenance.

The existing project, adopted by the river and harbor act of July 25, 1912, is for an 8-foot mean low water channel 70 feet wide between Portsville Landing and Laurel; to straighten and widen several sharp bends in the river; and to widen the channel below the railroad bridge so as to provide a suitable turning basin.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Bethel to Laurel					1880 [1]	640
Do					1891 [2]	1209
Mouth of river to Laurel	House	[1] 601	Sixty-first	Second		

[1] No map.

[2] Contains map.

No modification has been made in the existing project. Work under contract for maintenance was in progress during the year and resulted in restoring the channel of the previous project to required dimensions, except for a short distance at the upper end, where it was reduced to 60 feet in width to secure the stability of some wharves.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel is 8 feet. The mean range of tide is 3 feet. The length of the improved portion of the river is 4 miles. Laurel, the head of navigation, is 7½ miles from the mouth of the river.

The commerce of the river for the year ending May 1, 1909, is reported to be 28,480, and for the year ending December 31, 1911, 31,201 short tons, consisting of berry crates, fertilizers, gum logs, lumber, and general merchandise, valued at $250,735.

The improvement is reported to have made a reduction in railroad rates, but not in water rates. Funds asked for will be expended for maintenance.

July 1, 1911, balance unexpended	$2,177.58
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,140.15
July 1, 1912, balance unexpended	37.43
Amount appropriated by river and harbor act approved July 25, 1912	14,520.00
Amount available for fiscal year ending June 30, 1913	14,557.43
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]2,000.00

(See Appendix J 13.)

14. *Twitch Cove and Big Thoroughfare River, Md.*—This is a tidal stream extending from Chesapeake Bay on the western to Tangier Sound on the eastern side of Smiths Island, Md. It flows through the center of the island in a generally northwesterly and southeasterly direction, the trend of the current varying with the rise and fall of the tide. It is about 4 miles in length. The improved sections will be about 1 mile in length. The controlling depth in the stream is about 2½ feet at high tide. This is a new project, and no work has been done on the improvement.

The existing project, adopted by the river and harbor act of July 25, 1912, provides for a channel 4 feet deep at mean low water and 25 feet wide, at an estimated cost of $2,900, from Tangier Sound into Big Thoroughfare River, and one of the same dimensions around the point between said river and Tyler's River.

Report on examination and survey is to be found in House Document No. 285, Sixty-second Congress, second session (with map).

No modification has been made in the existing project. No work was done during the fiscal year.

The average rise and fall of the tide is 1.7 feet. The stream is navigable, in fact, from Tangier Sound to Chesapeake Bay, a distance of about 4 miles.

Amount appropriated by river and harbor act approved July 25, 1912	$2,900.00
Amount available for fiscal year ending June 30, 1913	2,900.00

(See Appendix J 14.)

15. *Crisfield Harbor, Md.*—This harbor is situated at Somers Cove, Little Annemessex River, which at this point is an estuary of Tangier Sound, on the east side of Chesapeake Bay. It is the principal port of the collection district of Eastern Maryland, and is about 116 miles southeast of Baltimore Harbor and about 95 miles north by east from Norfolk Harbor, and is about one-quarter mile square. The length of the portion of the channel included in the project is about 2 miles. Its lower end is about 1 mile above the mouth of the river. Originally the harbor had a controlling depth of 8½ feet at mean low water for a width of 400 feet, but this was not deemed adequate for the commerce of the port. The original project. adopted by the river and harbor act of March 3, 1875, was for a channel 266 feet wide and 12 feet deep at mean low water from above the railroad wharf to a point known as the second angle, opposite Somers Cove Light, and from that point to deep water below, a channel of the same depth 425 feet wide, and in addition a basin on both the north and south sides of the railroad wharf 12 feet deep, at

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[1] Exclusive of amount available for fiscal year 1913.

an estimated cost of $37,317.50. The work was completed May, 1876, with an expenditure of that amount.

The existing project, adopted by the river and harbor act of March 2, 1907, is to restore the channel formerly dredged, and to restore and widen the anchorage basin a maximum width of 250 feet to a depth of 10 feet, at an estimated cost of $37,706.62, and an annual cost of maintenance of $800. The estimated cost of the project was increased April 17, 1909, to $47,762, and again on February 10, 1911, to $51,942. Reports on examination and survey are to be found in House Document No. 783, Fifty-ninth Congress, first session, with map, and in the Annual Report of the Chief of Engineers for 1895, Part II, page 105. No modification has been made in the existing project. No work was done during the year and expenditures were for payment of retained percentages on former contract and proportion of office expenses.

To June 30, 1912, $47,758.90 has been expended on existing project, all for improvement. To June 30, 1912, the project has been about seven-eighths finished, completing the channel proper to project dimensions. The anchorage basin has not been completed.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel under improvement was 12 feet in the channel. The mean rise and fall of tide is 2.6 feet. The length of the improved section of the work is about 2 miles. Crisfield is the head of navigation, about 3 miles above the mouth of the river. The commerce of the harbor is reported to be as follows: 1906, 30,265; 1907, 30,738; 1908, 102,982; 1909, 104,027; 1910, 105,064; and for the year ending December 31, 1911, 239,027 short tons, consisting of agricultural products, canned goods, coal, clams, crabs (hard and soft), fish, general merchandise, lumber, oysters, sand, gravel, building stone, and cordwood, valued at $11,920,560.

The improvement has made no known difference in freight rates.

July 1, 1911, balance unexpended	$968.26
June 30, 1912, amount expended during fiscal year, for works of improvement	965.16
July 1, 1912, balance unexpended	3.10
Amount appropriated by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	5,003.10

(See Appendex J 15.)

16. Lower Thoroughfare, at or near Wenona, Deal Island, Md.—This is a tidal waterway between Deal Island and Little Deal Island, Md., extending from Tangier Sound, with varying widths of one-eighth to one-half mile and about 1½ miles long. It is about 20 miles north of Crisfield Harbor, Md. Before work was undertaken by the Government in 1881 the controlling depth was 2½ feet at mean low water. The original project adopted March 3, 1881, provided for a channel 7 feet deep at mean low water and 100 feet wide from Tangier Sound to the wharves of Daniel and of Vetra & Son, with a turning basin at the upper end, at an estimated cost of $10,000. There was appropriated March 3, 1881, and expended on this project $5,000.

The existing project is based on a survey made in 1907 and adopted by the river and harbir act approved June 25, 1910, which appropriated $5,300 and provided for restoring the channel heretofore dredged 80 feet wide and 6 feet deep at mean low water and widening it 100 feet at the angles, so as to furnish an anchorage, and extending the latter 100 feet, thus forming easy navigation for steamers and a needed landlocked harbor of refuge near the upper end, at an estimated cost of $5,300, with an annual cost for maintenance of $200. On account of shoaling that had taken place since the survey and estimate of cost was made, and for the reason that the unit price of dredging exceeded that in the original estimate, the estimated cost of the project was increased February 16, 1911, to $7,200.

Reports on examinations and surveys are to be found in House Document No. 76, Sixtieth Congress, first session (no maps), and in the Annual Report of the Chief of Engineers for 1881, pages 882–884. No modification has been made in the existing project. No work was in progress during the fiscal year and expenditures were for payment of retained percentage on a previous contract and proportion of office expenses.

The amount expended on the existing project to June 30, 1912, is $5,269.26, all of which was for improvement. To June 30, 1912, the project had been about 74 per cent completed. The maximum draft that could be carried June 30, 1912, over the shoalest part of the locality under improvement is about 4 feet. The mean range of tide is 2.2 feet. The length of the improved section of the work is about one-half mile. The head of navigation is about one-half mile above Wenona, which is about 3,000 feet from Tangier Sound. The commerce of the improvement for the year ending December 31, 1911, is reported to be 13,421 short tons, consisting of crabs (hard and soft), oysters, cordwood, and general merchandise, valued at $228,652. As this improvement is not entirely completed the effect of the project on freight rates can not be determined.

July 1, 1911, balance unexpended	$481.71
June 30, 1912, amount expended during fiscal year, for works of improvement	450.97
July 1, 1912, balance unexpended	30.74
Amount appropriated by river and harbor act approved July 25, 1912	2,000.00
Amount available for fiscal year ending June 30, 1913	2,030.74

(See Appendix J 16.)

17. *Broad Creek, Md.*—This is a tidal waterway flowing through a low, marshy region, the level of which is only slightly above high water. It connects Pocomoke Sound and Little Annemessex River, Md. It flows in a generally northerly and southerly direction, the course of the current depending on the rise and fall of the tide. It is about 2½ miles in length, and the improved section will be about 2 miles long. The controlling depth is about 1½ feet at mean low water. This is a new project, and no work has been done on the improvement.

The existing project, adopted by the river and harbor act of July 25, 1912, is for a channel 6 feet deep at mean low water, 100 feet wide in the straight reaches and 130 feet wide at the bends, at an estimated cost of $57,200.

The law requires that no portion of the appropriation shall be expended until the necessary right of way has been deeded and permission granted for the deposit of dredged material on the marsh at a sufficient distance to prevent its return to the creek, both free of cost to the United States.

Reports on examinations and surveys are to be found in Annual Report of Chief of Engineers for 1891, page 1221 (no map), and in House Document No. 269, Sixty-second Congress, second session (contains map).

No modification has been made in the existing project. No work was done during the fiscal year. The average rise and fall of the tide is about 1.9 feet. The stream is navigable, in fact, for its entire length, a distance of 2½ miles.

Amount appropriated by river and harbor act approved July 25, 1912	$57, 200.00
Amount available for fiscal year 1913	57, 200.00

(See Appendix J 17.)

18. Removing sunken vessels or craft obstructing or endangering navigation.—During the past year the following wrecks were removed: Schooner *Mary Liz Thomas*, from Hoopers Straits, Md., at a cost of $200; barge *Elizabeth E. Vane*, from Patapsco River, at a cost of $900; after portion of the schooner *Herbert D. Maxwell*, from Chesapeake Bay, near Governors Run Wharf, at a cost of $100; steamer *Lizzie Hunt*, from Elk River, Md., at a cost of $150. The total amount expended was $1,243.90, in addition to which there are outstanding liabilities at the end of the fiscal year amounting to $106.10 on account of removal of the *Lizzie Hunt*.

(See Appendix J 18.)

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and surveys required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. Preliminary examination, with plan and estimate of cost of improvement, of Broad Creek, Md., a waterway connecting Pocomoke Sound and Little Annemessex River.—Reports dated October 7, 1910, and January 16, 1911, are printed in House Document No. 269, Sixty-second Congress, second session. A plan for improvement, at an estimated cost of $57,200 for first construction and $200 annually for maintenance, is presented, subject to certain conditions of local cooperation specified.

2. Preliminary examination of Winchester Harbor [Creek], Md.—Report dated October 17, 1910, is printed in House Document No. 275, Sixty-second Congress, second session. The improvement of this harbor by the General Government in the manner apparently desired is not deemed advisable at the present time.

3. Preliminary examination and survey of Twitch Cove and Big Thoroughfare River, Md., connecting Tylers River with Tangier

Sound, in Chesapeake Bay.—Reports dated October 20, 1910, and July 5, 1911, with maps, are printed in House Document No. 285, Sixty-second Congress, second session. A plan for improvement, at an estimated cost of $2,900 for first construction and $100 annually for maintenance, is presented.

4. Preliminary examination and survey of Northeast River, Md., from its mouth to the town of North East.—Reports dated October 11, 1910, and July 3, 1911, are printed in House Document No. 397, Sixty-second Congress, second session. The improvement of this locality by the General Government, either alone or in cooperation with local interests, in the manner apparently desired is not deemed advisable at the present time.

5. Preliminary examination and survey of Tred Avon River, Md., with a view to securing increased width of channel from Easton Point to the mouth of Peach Blossom Creek.—Reports dated October 6, 1910, and June 26, 1911, with map, are printed in House Document No. 399, Sixty-second Congress, second session. A plan for improvement, at an estimated cost of $9,200 for first construction, is presented.

6. Preliminary examination and survey of Tilghman Island Harbor, Md., with a view to securing increased depth.—Reports dated October 8, 1910, and May 22, 1911, with map, are printed in House Document No. 400, Sixty-second Congress, second session. A plan for improvement, at an estimated cost of $7,820 for first construction, is presented.

EXAMINATIONS AND SURVEY MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Reports on preliminary examinations and survey required by the river and harbor act approved February 27, 1911, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. Preliminary examination of Susquehanna River, Md.—Report dated August 8, 1911, is printed in House Document No. 396, Sixty-second Congress, second session. The further improvement of this stream by the General Government in the manner apparently desired is not deemed advisable at the present time.

2. Preliminary examination of Manokin River, Md.—Report dated July 19, 1911, is printed in House Document No. 398, Sixty-second Congress, second session. The improvement of this stream by the General Government in the manner apparently desired is not deemed advisable at the present time.

3. Preliminary examination of channel connecting Miles River and Tred Avon River near Royal Oak, Md.—Report dated July 6, 1911, is printed in House Document No. 455, Sixty-second Congress, second session. The improvement by the General Government of the locality described, in the manner apparently desired, is not deemed advisable at the present time.

4. Preliminary examination and survey of Elk and Little Elk Rivers, Md.—Reports dated June 28, 1911, and January 17, 1912, with map, are printed in House Document No. 770, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $6,060 for first construction, provided local interests contribute one-third of this sum ($2,020), is presented.

IMPROVEMENT OF RIVERS AND HARBORS IN THE WASHINGTON, D. C., DISTRICT.

This district was in the charge of Lieut. Col. W. C. Langfitt, Corps of Engineers, having under his immediate orders Capt. Warren T. Hannum, Corps of Engineers, from July 1, 1911, to February 15, 1912, and First Lieut. Jarvis J. Bain, Corps of Engineers, from May 22, 1912, to the end of the fiscal year. Division Engineer, Col. William T. Rossell, Corps of Engineers.

1. Potomac River at Washington, D. C.—The Potomac River rises in West Virginia, in the Allegheny Mountains, and, flowing in a southeasterly direction 410 miles, empties into Chesapeake Bay.

The portion included in this project extends from the Aqueduct Bridge downstream 5 miles to Giesboro Point, D. C., which is 108 miles from the mouth of the river.

Before improvement, the channel was obstructed by two bars, the lower bar near Giesboro Point on which the minimum depth at mean low water was 14 feet, and the upper bar extending upstream one mile from the Highway Bridge, in what is known as Virginia Channel, on which the minimum depth at mean low water was 8 feet.

The minimum depth at mean low water in the Washington channel was 10 feet. Georgetown Harbor was obstructed by several dangerous rocks. The flats, which extended to the edge of the Virginia Channel, were largely bare at low water and were an active agent in spreading malarial and other diseases.

In 1849 $1,500 was appropriated for a survey of the river. Of this sum $1,208.61 was expended and the balance of $291.39 covered into the surplus fund of the Treasury.

Between June 11, 1870, and March 3, 1881, the sum of $290,000 was appropriated by Congress for the improvement of the harbors of Washington and Georgetown. The project under which this last-mentioned sum was expended is not definitely stated, although it is understood that it provided for dredging channels 15 feet deep and 200 feet wide through the Georgetown and Washington Channels, and for the removal of the most dangerous rocks obstructing navigation in the harbor of Georgetown to a depth of 20 feet.

The existing project for the improvement, estimated to cost $2,500,000, was adopted August 2, 1882 and is contained in Senate Executive Document No. 126, Forty-seventh Congress, first session, which contains maps, and also in the Annual Report of the Chief of Engineers for 1882, page 980.

The project has for its object the improvement of the navigation of the river by widening and deepening its channels, the reclamation of the flats by depositing on them the material dredged from the channels, the freeing of the Washington Channel of sewage, and the establishment of harbor lines. To effect these, the project provided "that the channel depths * * * should be sufficient to accommodate the largest draft vessels that can be brought up to Arsenal Point" (the projected depth was not stated in feet, but by the above-imposed condition was at that time limited to 20 feet at low tide, whereas the ruling depth in the Potomac River below Washington has now been increased by dredging to 24 feet at low tide), that the flats be reclaimed to a height of 3 feet above the flood plane of 1877 (which, although the highest recorded freshet at that time, was exceeded by about 3 feet by the flood of 1889), and for a tidal reservoir to be provided with automatic inlet and outlet gates. A training dike on the Virginia shore extending downstream from Analostan Island was added to the project in 1890. The project also provided for the rebuilding of Long Bridge and for the interception of all sewage discharged into the Washington Channel, but neither of these works was included in the estimated cost of the improvement. The estimated cost was increased in 1883 to $2,716,365, and in 1897 was increased to $2,953,020 to provide for shrinkage and settlement of material in fills.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Georgetown to Giesboro Point, including Washington Channel.	Senate	[1] 126	Forty-seventh	First		
Do					1883 [1]	776
Borings on site of sluice gates					1886 [1]	885
Upper bar					1894 [1]	984
Do					1897 [1]	1316

[1] Contains maps.

Maps of the locality may also be found in Annual Reports of the Chief of Engineers for 1884, 1885, 1887 to 1892, inclusive, 1895, 1896, and 1898 to 1904, inclusive.

The existing project provides for dredging the Virginia Channel 20 feet deep and of sufficient width to afford a low-water cross-sectional area of 25,000 square feet; for dredging the Washington Channel 20 feet deep, for the reclamation of the flats to 3 feet above the freshet elevation of 1877, by depositing the dredged material thereon; for the construction of a tidal reservoir to periodically flush the Washington Channel; for the establishment of harbor lines; and for the construction of a training dike in the Virginia Channel, at an estimated cost of $2,953,020.

The work of improvement during the fiscal year consisted in dredging 453,552 cubic yards of material from the Washington Channel and depositing it on Section III of Potomac Park. The work of maintenance for the fiscal year consisted in some redredging in Washington Channel, in repairing and rebuilding 2,700 linear feet of sea wall and 3,548 linear feet of training dikes, in repairs made to inlet and outlet gates for tidal reservoir, and in building and repairing floating plant. The total expenditure was $69,576.64, of which $24,269.88 was for the maintenance of work.

The amount expended on the work of the existing project to June 30, 1912, was $3,013,690.97, of which $572,257.46 has been applied to maintenance since March 3, 1899. The following sums have been obtained from other sources than appropriations: Received from sale of blueprints, 50 cents; of condemned property, $331.08; total, $331.58.

This expenditure resulted in obtaining the following channels by dredging: Virginia Channel, 4 miles long, about 500 feet wide, and 20 feet deep; Washington Channel, 2¾ miles long, having a 400-foot width to a depth of 24 to 26 feet and a 350-foot width to a depth of 18 to 20 feet; in dredging the tidal reservoir to a depth of 8 feet over its entire area (111 acres); in fully reclaiming Potomac Park with the dredged material; in completing the inlet and outlet gates for the tidal basin; in constructing 36,975 linear feet of sea wall around the reclaimed area and rebuilding 26,239 linear feet thereof; in building 5,965 linear feet of training dike to the height of 6 feet above mean low water and restoring this height, where settlement had occurred, for 4,060 linear feet thereof (the total amount of riprap used in the construction and maintenance of the training dike is about 28,198.9 cubic yards); and in removing dangerous rocks from the Georgetown Harbor. The above-mentioned channels have been redredged from time to time for maintenance, thereby removing freshet accretion. The total amount of material dredged from these channels and deposited on the flats is about 15,712,870 cubic yards, paid for under the various contracts, and about 3,383,235 cubic yards, not paid for, owing to excavation being carried beyond the limits specified in the various contracts. The amount of material received from private parties working under permits without cost to the United States and deposited on the flats is about 922,200 cubic yards. The area of land reclaimed by these operations is 628 acres (including reservoir, 739 acres), which by act of March 3, 1897, was declared to be a public park, under the name of Potomac Park. The upper part of this park having been completed was turned over to the office of public buildings and grounds, and subsequently was developed by that office into one of the most beautiful parks of this country.

The work of the project is now about 82 per cent completed and the benefits to navigation and general health of the community derived from the improvement have been most marked. Larger and deeper draft vessels are now engaged in trade and it is understood that freight rates have been materially reduced from those formerly charged. The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the Washington Channel was 24 feet and of the Virginia Channel 17.5 feet. The mean range of tide is about 3 feet. The Potomac River is navigable to the foot of Little Falls, 3½ miles above Georgetown, but the Aqueduct Bridge, which crosses the river at Georgetown, 113 miles above the mouth of the river, has no draw and limits the navigation of large steamers and masted vessels.

The principal articles of commerce, in the order of their relative values, are general merchandise, coal, fish, oils, lumber, oysters and clams, sand and gravel, gasoline, produce, stone, manufactured iron and steel, melons, crabs and crab meat, fertilizer, laths, canned goods, asphalt, and ice. The receipts and shipments during 1911 amounted to 795,900 short tons and were estimated to be worth $12,995,447.

The funds, $30,000, asked for for the fiscal year 1914 will be used for maintenance of channels, sea walls, inlet and outlet gates of tidal reservoir, and other work incidental to the maintenance of improvement.

July 1, 1911, balance unexpended		$113,459.21
Received from sale of condemned property		12.25
		113,471.46
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$45,306.76	
For maintenance of improvement	24,269.88	
		69,576.64
July 1, 1912, balance unexpended		43,894.82
July 1, 1912, outstanding liabilities		1,300.00
July 1, 1912, balance available		42,594.82
Amount appropriated by river and harbor act approved July 25, 1912		40,000.00
Amount available for fiscal year ending June 30, 1913		82,594.82
July 1, 1912, amount covered by uncompleted contracts		16,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 30,000.00

(See Appendix K 1.)

2. *Anacostia River, D. C.*—The Anacostia River, about 20 miles in length, rises in Maryland, flows in a southwesterly direction, and empties into the Potomac at Washington, D. C. The section under improvement is about 2 miles long, extending from Anacostia Bridge, near the navy yard, to the Potomac River. Before improvement this section was from one-half to 1 mile wide; the channel was narrow, tortuous, and had the ruling depth of about 18 feet; between the narrow channel and the shore there were extensive flats with depths of 1 to 4 feet, which were covered in summer with aquatic grasses and plants. Sewage was discharged into the river and collected in the aquatic plants on the flats, which caused offensive and unhealthy conditions.

An allotment of $20,000 for work in the Anacostia was made from the appropriation of September 19, 1890, for improving Potomac River at Washington. Under this allotment channels 20 feet deep and about 200 feet wide were dredged through shoals near the foot of South Capitol Street and opposite Washington Barracks. This dredging was completed in May, 1892, at a cost of $18,536.94, and the balance, $1,463.06, was applied to the present project.

The existing project for this stream was adopted June 13, 1902, in accordance with plan printed in House Document No. 87, Fifty-fifth Congress, third session, which contains maps, and in the Annual Report of the Chief of Engineers for 1899, page 1443. It provides for the improvement of the portion of Anacostia River below the Navy Yard Bridge by dredging a channel 20 feet deep for a width of 400 feet, the depth then gradually decreasing to 6 feet at the bulkhead lines, and by depositing the dredged material on the adjacent flats to an average elevation of 7 feet above low tide, the reclaimed area to be surrounded by an earthen embankment to a height of 14 feet above low tide, protected by a masonry sea wall, and provided with suitable drainage through the embankment, all at an estimated cost of $1,218,525.

Maps of the locality will be found in the Annual Reports of the Chief of Engineers for 1903, 1904, 1905, 1906, and 1909.

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[1] Exclusive of amount available for fiscal year 1913.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No	Congress.	Session.	Year.	Page.
District of Columbia and Maryland, Bladensburg to mouth.					1892 [1]	1064 1068
Below Navy Yard Bridge					1890 [2]	1443
Below Navy Yard Bridge	House	[2] 30	Fifty-second	First		
District of Columbia and Maryland, Bladensburg to mouth.	do	[2] 87	Fifty-fifth	Third		

[1] No maps.

[2] Contains maps.

A report relative to the title to Anacostia Flats is printed in House Document No. 194, Fifty-ninth Congress, first session; Senate Document No. 462, Sixty-first Congress, second session; and Senate Document No. 19, Sixty-second Congress, first session.

No modification of the existing project has been made to date.

The work of improvement during the fiscal year consisted in dredging, sea-wall work, embankment work, and the construction of floating plant. The work of maintenance during the fiscal year consisted in redredging, restoring sea-wall foundations, embankment work, and making repairs to floating plant and Government property. The total expenditure was $217,954.61, of which $20,839.58 was for maintenance work.

The amount expended on the existing project to June 30, 1912, was $545,524.40, of which $68,156.38 was applied to maintenance. As a result of this expenditure, a channel 1.8 miles long has been dredged to the full projected dimensions from the mouth to the upper limits of the navy yard, and some dredging has been done between the channel limits and the bulkhead lines. The amount of material excavated under various contracts, 5,190,257 cubic yards, and the amount dredged by private parties working under permits from, but without cost to the Government, about 104,932 cubic yards, were deposited on the portions of the flats assigned for reclamation. In addition about 358,362 cubic yards of material have been dredged by other departments of the Government or private parties and deposited at other locations. Riprap foundations for masonry sea wall, containing 14,384.5 cubic yards of cobblestones and 67,322.8 cubic yards of riprap, have been built along the left bulkhead line for a distance of about 12,300 feet; 1,400 linear feet of sea wall have been constructed; 791 piles of the old dismantled wharf opposite the navy yard have been removed; and 340 acres of flats have been reclaimed or partially reclaimed by the deposit of excavated material. Harbor lines from the mouth of the river to Massachusetts Avenue were established in June, 1904.

The entire project is now about 50 per cent completed.

The improvement already made has been of great benefit to navigation and has resulted in the diversion of considerable traffic from the Washington Channel, where conditions were rapidly becoming congested.

Health conditions in the portion of the city bordering on the Anacostia River are greatly improved.

The maximum draft that could be carried on June 30, 1912, over the shoalest part of the locality under improvement was 21 feet. The mean range of tide is about 3 feet.

Anacostia River is navigable for large vessels to the Navy Yard Bridge, for tugs and small vessels to Pennsylvania Avenue Bridge, and for small scows and lighters to Bladensburg, Md., respectively, 2, 2¾, and 8¾ miles above its mouth.

The principal articles of commerce in the order of their relative values are naval ordnance and supplies, powder-making materials, oils, brick, sand and gravel, coal, paving blocks, stone, lumber, asphalt, brick clay, iron and steel, and cordwood. The receipts and shipments during 1911 amounted to 335,347 short tons, and were estimated to be worth $31,567,750.

This increase in value is due to the fact that much better statements were secured from the officers in charge of the navy yard and naval proving grounds than in previous years.

It is not known that any reduction in freight rates has resulted from the work done.

The funds, $75,000, asked for the fiscal year 1914, will be used for dredging, sea-wall work, and prosecution of the work of improvement.

July 1, 1911, balance unexpended		$390, 893. 27
Received from sale of steamer *Gen. Warren* to the District of Columbia		500. 00
		391, 393. 27
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$197, 115. 03	
For maintenance of improvement	20, 839. 58	
		217, 954. 61
July 1, 1912, balance unexpended		173, 438. 66
July 1, 1912, outstanding liabilities		2, 700. 00
July 1, 1912, balance available		170, 738. 66
Amount appropriated by river and harbor act approved July 25, 1912		50, 000. 00
Amount available for fiscal year ending June 30, 1913		220, 738. 66
July 1, 1912, amount covered by uncompleted contracts		75, 000. 00
Amount (estimated) required to be appropriated for completion of existing project		[1] 518, 062. 57
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[1] 75, 000. 00

(See Appendix K 2.)

3. *Potomac River at Alexandria, Va.*—The Potomac River in front of Alexandria, Va., has a deep-water channel about one-half mile wide and is built up solidly with wharves for a length of nearly a mile. The city of Alexandria is situated on the right bank of the Potomac about 5 miles below Washington, D. C., is one of the oldest cities in the United States, and has long been a port of entry. Bills of lading

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[1] Exclusive of amount available for fiscal year 1913.

dating back to 1732 are in existence, but it had been established as a port prior to that. It is stated by those familiar with the locality that up to 20 years ago the main current of the Potomac was deflected from the opposite Maryland shore above Shepherds Landing and ran close in front of the wharves at Alexandria, maintaining a depth of 20 feet or more along the entire wharf front, and that during the great freshet of June, 1889, an old steamboat's hull was sunk near the upper limits of the city and diverted the currents which had swept past the city front, resulting in the formation of a bar of mud. The water depths were decreased in the harbor to about 10 feet at the upper end and 16 feet near the center, there being no perceptible change of depth at the lower end.

The existing project for the improvement, adopted by the river and harbor act of June 25, 1910, provides for dredging necessary to afford a depth of 24 feet at mean low water over the area in front of the city of Alexandria between deep water of the through channel and a line drawn 20 feet outside of the established pierhead line, about 6,700 feet in length and averaging 300 feet in width, in accordance with plan printed in House Document No. 1253, Sixtieth Congress, second session, which contains maps. The estimated cost of the project is $116,000, with an additional charge of about $2,000 a year for maintenance.

A map of the locality may be found in House Document No. 1253, Sixtieth Congress, second session, containing the report on examination and survey.

No modification has been made in the existing project to date.

The work of improvement during the fiscal year consisted in dredging 332,497 cubic yards of material from the channel and depositing it in Battery Cove. The work of maintenance during the fiscal year consisted in rebuilding retaining wall and embankments where settlement occurred. The total expenditure was $73,727.01, of which $6,189.59 was for work of maintenance.

The amount expended on the existing project to June 30, 1912, was $101,404.11, of which $6,189.59 was applied to maintenance, and the following results have been accomplished:

The wreck of the "old steamboat's hull" has been removed. The dredging in front of the city, about 7,300 linear feet, was completed to the full projected dimensions on December 29, 1911. The amount of material excavated and paid for under various contracts was 538,278 cubic yards, and the amount not paid for, owing to excavation having been done beyond the limits specified in the contracts, was about 149,395 cubic yards. All this material, together with about 60,000 cubic yards removed by private parties working under permits from but without cost to the United States, amounting to a total of 747,673 cubic yards, was deposited in Battery Cove, and the cove was thereby reclaimed to the average height of 7½ feet above the mean low water. A retaining wall was constructed, preparatory to the deposit of the excavated material, across the mouth of Battery Cove to inclose the area thereof, amounting to 50 acres. This wall is 2.730 feet long and contains 8,032.9 cubic yards of cobblestones and 4,952.9 cubic yards of riprap. Harbor lines were established for this port on June 1, 1909.

All the work of the approved project has been completed.

The benefits to navigation derived from the improvement consist of allowing deep-draft steamers and vessels entrance to this port, and the trade thereby has been increased. Incidentally the locality has been benefited by the fill made in Battery Cove, which has heretofore been shoal and stagnant and an active and prolific agent in spreading malarial and other diseases. The Government also receives the benefit of being partly reimbursed for the money expended on the improvement to the amount of the value, estimated to be from $20,000 to $50,000, of the 50 acres of land reclaimed.

The maximum draft that could be carried over the shoalest part of the area in front of the city of Alexandria on June 30, 1912, at mean low water was 24 feet. The mean range of tide is 3 feet.

The principal articles of commerce, in the order of their relative values, are general merchandise, fertilizer and fertilizer materials, bottles, coal, railroad ties, drugs, lumber, canned goods, flour, vinegar, ice, fish, beer, oils, and hay and feed. The receipts and shipments during 1911 amounted to 212,560 short tons, and were estimated to be worth $4,672,753.

It is not known that freight rates have been reduced.

As the funds now available are sufficient to provide for maintenance, no further appropriation is at present recommended.

July 1, 1911, balance unexpended		$88,322.90
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$67,537.42	
For maintenance of improvement	6,189.59	
		73,727.01
July 1, 1912, balance unexpended		14,595.89
July 1, 1912, outstanding liabilities		66.00
July 1, 1912, balance available		14,529.89

(See Appendix K 3.)

4. *Potomac River at Lower Cedar Point, Md.*—Lower Cedar Point is a long, narrow point of land projecting into Potomac River on the left bank of the river about 61 miles below Washington. On its southern side a wharf of commodious capacity is used as a shipping point for persons residing within a radius of 6 or 7 miles. The ruling depth was 7 feet in 1907. Twenty or twenty-five years ago the channel was dredged to a depth of about 10 feet at the expense of private parties. Portions of this channel gradually shoaled until the width was not sufficient for navigation.

The existing project for the improvement, adopted by the river and harbor act of June 25, 1910, provides for dredging a channel 150 feet wide and 10 feet deep to Dills Wharf by way of the "west channel," with a turning basin at the wharf of the same depth, 300 feet wide and 400 feet long, the aggregate length of channel and turning basin being about two-fifths mile, in accordance with plan printed in House Document No. 918, Sixtieth Congress, first session, which contains map. The estimated cost of this project is $13,300, with an additional charge of about $600 a year for maintenance.

The work of the fiscal year consisted in rebuilding dredge *Dalecarlia* and fitting up floating plant, and the incidental expenditure thereto, $3,066.49, was applied to maintenace.

The amount expended on the existing project to June 30, 1912, was $13,300, of which $3,066.49 was applied to maintenance. The expenditure resulted in completing the project by dredging the channel and turning basin, aggregating 1,950 feet in length and to full projected width and depth. The amount excavated was 35,297 cubic yards.

A map of the locality may be found in House Document No. 918, Sixtieth Congress, first session, containing the report on examination and survey, and in the district officer's report of this fiscal year, and in Annual Report of the Chief of Engineers for 1911, page 1450.

No modification of the existing project has been made.

All work of the approved project has been completed. The benefits to navigation derived from the improvement consist of allowing steamers of fuly 3 feet deeper draft to land at this port, making it possible for the steamers of the Washington and Baltimore line to trade at this port. The maximum draft that could be carried over the shoalest part of the locality on June 30, 1912, was 10 feet at mean low water. The mean range of tide is about 1.8 feet. The principle articles of commerce in the order of their relative values are general merchandise, live stock, tobacco, manufactured iron and steel, farm produce, grain and seeds, fertilizer, flour, and building materials. The receipts and shipments during 1911 amounted to 1,755 short tons, and were estimated to be worth $120,392.

It is not known that freight rates have been reduced.

The funds, $3,000, asked for for the fiscal year 1914, will be applied to redredging and maintenance of improvement.

July 1, 1911, balance unexpended	$3,066.49
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	3,066.49
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 3,000.00

(See Appendix K 4.)

5. *Upper Machodoc Creek, Va.*—Upper Machodoc Creek, rising in Virginia, is a tidal stream of a total length of about 10 miles, having few fluvial characteristics, entering the Potomac River from the south about 63 miles below Washington, D. C. In 1909 about 5¼ feet at mean low water could be carried to Brickhouse Wharf over Donothon and Brickhouse Bars, and thence 4½ feet to Little Ferry Wharf over Reel Bar. From Little Ferry Wharf to Milford, 7.7 miles above the mouth, at the head of navigation, six shoals were encountered, having from 4 to 5 feet of water over them. The aggregate length of Donothon, Brickhouse, and Reel Bars is 6,570 feet, and the aggregate length of the five bars above Little Ferry Wharf was 7,400 feet.

The existing project for the improvement, adopted by the river and harbor act of June 25, 1910, provides for dredging channels 100 feet wide and 6½ feet deep from the mouth of the creek to Little Ferry Wharf, and channels 50 feet wide and 6 feet deep from Little Ferry Wharf to Milford Landing, with a turning basin of the same depth at Little Ferry and Milford Landing of sufficient size to accommodate navigation, at the estimated cost of $23,200, with an additional charge of about $1,600 annually for maintenance, in accordance with plan printed in Rivers and Harbors Committee Document No. 4, Sixty-first Congress, second session, which does not contain maps.

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[1] Exclusive of the balance unexpended July 1, 1912.

The report on examination and survey is contained in Rivers and Harbors Committee Document No. 4, Sixty-first Congress, second session, and covers the creek from its mouth to Milford Landing. The maps accompanying report were not printed.

No modification in the project has as yet been made.

The work of improvement during the fiscal year consisted in dredging channels 7,400 feet long and 67,063 cubic yards of excavation.

The work of maintenance during the fiscal year consisted in rebuilding dredge *Dalecarlia* and fitting up floating plant. The total expenditure was $14,303.33, of which $2,918.72 was for maintenance.

The amount expended on the existing project to June 30, 1912, was $23,200, of which $2,918.72 was applied to maintenance. As a result of this expenditure, channels aggregating about 2.65 miles in length have been dredged from the mouth to Milford through all 10 bars to the full projected dimensions. The amount of material excavated from these channels was 128,368 cubic yards.

All work of the approved project has been completed. The benefits to navigation from the improvement so far made consist of permitting the steamers to enter the creek at low tides and giving an uninterrupted service. Formerly the steamers were barred from entering the creek by low tides.

The maximum draft that could be carried at mean low water over the shoalest part of the locality on June 30, 1912, was 7 feet between the mouth and Little Ferry Wharf, and about 6½ feet from there to Milford. The mean range of tide is about 1.8 feet. Milford is the head of navigation for steamers. Small craft can proceed about a mile farther up the creek.

The principal articles of commerce in the order of their relative values are general merchandise, railroad ties, farm produce, lumber, fertilizer, grain and seeds, live stock, manufactured iron and steel, building materials, and pulpwood. The receipts and shipments during 1911 amounted to 9,829 short tons, and were estimated to be worth $124,265.

It is not known that freight rates have been reduced.

The funds, $3,200, asked for the fiscal year 1914 will be applied to redredging and maintenance of improvement.

July 1, 1911, balance unexpended		$14,303.33
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$11,384.61	
For maintenance of improvement	2,918.72	
		14,303.33
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 3,200.00

(See Appendix K 5.)

6. *Aquia Creek, Va.*—Aquia Creek lies wholly within the limits of Stafford County, Va., flows in a southeasterly direction and enters Potomac River from the right bank at about 41 miles below Washington, D. C. From the source to Wharton's Landing it is shoal, narrow, and has no navigable importance. Before improvement was begun the creek had a well defined channel (60 to 200 feet

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[1] Exclusive of the balance unexpended July 1, 1912.

wide by 2 to 17 feet deep) between Whartons Landing and the Narrows, a distance of 3 miles; and from the Narrows to Thorny Point, a distance of 3½ miles, the stream expanded into a bay, 1,000 to 6,000 feet wide and 2 to 5 feet deep. Near Thorny Point the depth increased and a channel 6 or 7 feet deep and fully 150 feet wide was available to the mouth, a distance of 1 mile. The Richmond, Fredericksburg & Potomac Railroad crossed the creek on a trestle bridge provided with a 30-foot draw at 1¼ miles below the Narrows, or 3¼ miles above the mouth.

The first project for improvement, adopted by river and harbor act of June 10, 1872, was in accordance with plans printed in Senate Executive Document No. 35, Fortieth Congress, second session, and the Annual Report, Chief of Engineers for 1872, pages 708 to 710 (neither of which contain maps), and provided for dredging a channel 40 feet wide and 6 feet deep from the Narrows to the natural 6-foot depth, about 2¼ miles therebelow, at an estimated cost of $18,000. Congress made four appropriations, amounting to $10,500, the last being made on June 18, 1878, for completing the improvement. Accordingly this project was completed with the expenditure of the $10,500 on December 25, 1878. The resulting dredged channel was about 1¾ miles long, 40 to 50 feet wide, and 4½ to 6 feet deep, and the amount of material excavated was about 67,576 cubic yards.

No further work was done until the second project was adopted by river and harbor act approved September 19, 1890. This project, based on plans printed in House Executive Document No. 135 (contains map), Fifty-first Congress, first session, and in the Annual Report, Chief of Engineers, for 1890, pages 1096 to 1103 (no map), provided for dredging a channel 150 feet wide and 8 feet deep from the mouth to the Narrows, for dredging a channel 80 feet wide and 8 feet deep off the mouth of Austin Run, and for the construction of a brush or timber dike off Austin Run at the estimated cost of $101,278. This project as modified by the Secretary of War on December 4, 1890, provided for dredging a channel 80 feet wide and 6 feet deep from the mouth to the Narrows, work above the Narrows being omitted, at the estimated cost of $40,000, which was later reduced to $21,000. Between 1890 and 1896 Congress made four appropriations, amounting to $21,000, of which $463.36 was returned to the Treasury. Accordingly, this project was completed on December 4, 1897, by the expenditure of $20,536.64, which resulted in dredging through all shoals having less than 6 feet depth, between the mouth and the Narrows, in making a channel about 3½ miles long, 80 feet wide and 6 feet deep, and in the excavation of 128,295 cubic yards of earth. No further work was done under this project.

The existing project adopted by river and harbor act of July 25, 1912, is in accordance with plans printed in House Document No. 579 (contains map), Sixty-second Congress, second session, and provides for dredging channels 6 feet deep and 100 feet wide from the mouth to the railroad bridge, 60 feet wide from the railroad bridge to about 400 yards below Coal Landing, and 100 to 150 feet wide from about 400 yards below to about 100 yards above Coal Landing, at the estimated cost of $21,400, with an additional cost of $1,000 annually for maintenance. No modification has been made in the existing project.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
The Narrows to mouth	Senate	[1] 85	Fortieth	Second	1872 [1]	708–710
Wharton Landing to mouth	House	[2] 135	Fifty-first	First	1890 [1]	1096–1108
Dent Landing to Coal Landing	do	[1] 964	Sixtieth	do		

[1] No maps.

[2] Contains maps.

Reference to work done under previous projects, Annual Reports for 1872 to 1879, inclusive, for 1890 to 1899, inclusive, and for 1903 to 1905, inclusive. None of these reports contain maps.

An appropriation of $21,400 was made by the act of July 25, 1912, after the close of the fiscal year; consequently no work was done and no expenditure was made under the existing project during the fiscal year.

The principal articles of commerce, in the order of their relative values, are lumber, railroad ties, and other forest products. The receipts and shipments during the year 1911 are not available, but it is believed there has been no change from the latest, those of year September, 1909, to September, 1910, which amounted to about 20,340 short tons, valued at $141,900.

As the appropriation of $21,400, made on July 25, 1912, was for completion of the project, no further appropriation is at present required.

Amount appropriated by river and harbor act approved July 25, 1912	$21,400
Amount available for fiscal year ending June 30, 1913	21,400

(See Appendix K 6.)

7. *Nomini Creek, Va.*—Nomini Creek, rising in Virginia, with a total length of but 6 miles, is a tidal stream having few fluvial characteristics. It enters the Potomac from the south about 80 miles below Washington, D. C. Before improvement, navigation was obstructed by a bar about 1 mile long at the entrance, over which but 3 feet could be carried at low tide. Except for this bar, a draft of 8 feet could be carried to Nomini Ferry, 4 miles above the mouth, and 5 feet could be carried 2 miles farther to the head of navigation.

The original project for this improvement, adopted by the river and harbor act of March 3, 1873, was in accordance with plan printed in Senate Document No. 25, Forty-second Congress, third session, which does not contain maps, and in the Annual Report of the Chief of Engineers, 1873, page 822. This project, as subsequently modified in 1879, 1885, 1888, 1890, 1897, and 1908, is the existing project, and provides for a channel through the bar at the entrance 150 feet wide and 9 feet deep, with a jetty about 2,370 feet long at the mouth, at an estimated cost of $105,000.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Bar at mouth of creek					1873 [1]	822–824
From the ferry to the head of tide water.					1881 [1]	954
Bar at mouth of creek	Senate	[1] 25	Forty-second	First		

[1] No maps.

A map of the locality may be found in the Annual Reports of the Chief of Engineers for 1885 and 1889.

The work of improvement during the fiscal year consisted of extending riprap jetty 300 linear feet, and the construction of floating plant. The work of maintenance during the fiscal year consisted in repairing the portions of the jetty which had been previously built and the maintenance of floating plant.

The total expenditure was $6,093.42, of which $2,638.50 was for maintenance work.

The amount expended to June 30, 1912, was $91,994.20, of which $13,547.99 was applied to maintenance subsequent to March 3, 1899. As a result of this expenditure, a channel about 1 mile in length has been dredged and redredged to the full projected dimensions; the amount of material dredged was 144,574 cubic yards and 2,410 linear feet of jetty has been constructed by the placement of 7,237 cubic yards of riprap and about 3,000 cubic yards of oyster shells.

The project has been completed and the work done has been of substantial benefit to navigation.

The maximum draft that could be carried on June 30, 1912, at mean low tide over the shoalest part of the locality under improvement, was 9 feet. The mean range of tide is 1.8 feet. Steamers can now enter the creek. Nomini Ferry, 4 miles above the mouth, is the head of navigation for steamers and large vessels. Smaller vessels ascend the stream for an additional distance of 2 miles, over which a depth of 5 feet is available.

The principal articles of commerce in the order of their relative values are farm produce, general merchandise, canned goods, railroad ties, fertilizer, oysters, live stock, lumber, grain, fish and crabs, cordwood, and flour. The receipts and shipments during 1911 amounted to 20,777 short tons, and were estimated to be worth $539,475.

It is understood that freight rates have been considerably reduced and shipments much facilitated.

As the funds now available are sufficient to provide for maintenance, no further appropriation is at present recommended.

July 1, 1911, balance unexpended		$10,099.22
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$3,454.92	
For maintenance of improvement	2,638.50	
		6,093.42
July 1, 1912, balance unexpended		4,005.80

(See Appendix K 7.)

8. *Dymers Creek, Va.*—Dymers Creek is a tidal estuary entering Fleets Bay about 3 miles north of the mouth of the Rappahannock River. The creek is a landlocked harbor about 1 square mile in area, suitable for vessels seeking refuge from storms, and affords anchorage of from 15 to 18 feet in depth. It is indented by eight coves. In 1909, before improvement, the entrance was obstructed by a narrow sand reef having only from 11 to 12 feet of water over it.

The original and existing project for the improvement, adopted by the river and harbor act of June 25, 1910, in accordance with plan printed in House Document No. 325, Sixty-first Congress, second session (without maps), provides for dredging a channel about 600 feet long, 200 feet wide, and 15 feet deep through the narrow sand reef at the entrance to the creek, at an estimated cost of $9,000, with an additional estimate of about $500 a year for maintenance.

A report on examination and survey of Dymers Creek covering the bar at the mouth of the creek is contained in House Document No. 325, Sixty-first Congress, second session. The map accompanying was not printed.

This project has not been modified.

The work of the fiscal year consisted in rebuilding the dredge *Dalecarlia*, and fitting other floating plant, and the expenditure, $3,418.01, incidental thereto, was applied to maintenance.

The amount expended on the existing project to June 30, 1912, was $9,000, of which $3,418.01 was applied to maintenance. The expenditure resulted in completing the project by dredging a channel 650 feet long by 200 feet wide and 15½ feet deep through the reef at the entrance to the creek. The amount of material excavated was 17,889 cubic yards.

The project has been completed and the work done has benefited navigation to the extent of making this stream a harbor of refuge for deeper-draft boats, and permitting the local steamers (engaged by the factories manufacturing fertilizers from menhaden fish caught in the bay) entrance and exit at all conditions of tides. Formerly this passage over the reef was confined to high tide.

The maximum draft that could be carried over the shoalest part of the locality at mean low water on June 30, 1912, was about 15½ feet. The mean range of tide is about 1.3 feet. Large steamers enter this creek for embarking and discharging cargoes at Ocran, Gumby, and Chase, at 1¾, 2, and 2½ miles, respectively, above the obstruction. The head of 15-foot navigation is at Chase, and smaller craft can proceed half a mile farther up.

The principal articles of commerce, in the order of their relative values, are fish scrap for fertilizer, general merchandise, fish oil, fish and crabs, coal, machinery, nets, oils, lumber, and flour. The receipts and shipments during 1911 amounted to 16,663 short tons, and were estimated to be worth $505,940.

It is not known that freight rates have been reduced.

As the work provided for under the project has been completed, and as maintenance will not be required for several years, no appropriation is now recommended.

July 1, 1911, balance unexpended	$3,418.01
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	3,418.01

(See Appendix K 8.)

9. York, Mattaponi and Pamunkey Rivers, and Occoquan Creek, Va.—(a) York River.—The York River is formed at West Point, Va., by the confluence of the Mattaponi and Pamunkey Rivers, and empties into Chesapeake Bay, 41 miles from West Point, and 20 miles from Fortress Monroe. Prior to improvement, 24 feet could be carried up York River for a distance of 32 miles to Potopotank bar, over which the ruling depth was 18½ feet. West Point bar, the only other obstruction to navigation, had a least depth of 15½ feet.

The original project for this improvement, adopted by river and harbor act of June 14, 1880, was in accordance with plan printed in Senate Document No. 104, Forty-sixth Congress, second session, which does not contain maps, and also in Annual Report of the Chief of Engineers for 1880, page 897. This project, as subsequently modified in 1884 and 1887, forms the existing project and provides for dredging channels 22 feet deep at mean low water and 400 feet wide through the bars and for the construction of a dike along the right bank at West Point bar to maintain the channel, at a total estimated cost of $308,800.

Maps of the locality may be found in the Annual Reports of the Chief of Engineers for 1885, 1886, 1887, and 1894.

A report on the examination and survey of York River, Va., will be found in the Annual Report of the Chief of Engineers for 1880, pages 897-900, and in Senate Document No. 104, Forty-sixth Congress, second session.

The work of the fiscal year consisted in rebuilding dredge *Dalecarlia*, and fitting up floating plant and the incidental expenditure, $3,509.16, was applied to maintenance.

The amount expended to June 30, 1912, was $282,651.49, of which $54,728.26 was applied to maintenance subsequent to March 3, 1899. This expenditure has resulted in a dredged channel about one-half mile long, 105 feet wide, and 22 feet deep at Potopotank, and another channel 2 miles long, 22 feet deep, and 160 to 260 feet wide at West Point bar: A training dike 10,142 feet long has been constructed at West Point bar, of which 9,850 linear feet has been rebuilt. The total amount of material dredged from the channel is about 1,160,100 cubic yards.

The work on the project is now about 75 per cent completed and has been of much importance to commerce. However, the commerce carried by deep draft ocean going vessels has been diverted from the port of West Point and now only coastwise trade is carried on by comparatively light-draft vessels.

The maximum draft that could be carried on June 30, 1912, at mean low tide over the shoalest part of the locality under improvement was about 20 feet. The mean range of tides is about 3 feet. York River is navigable, throughout its entire length of 41 miles, to West Point at its head.

The principal articles of commerce in the order of their relative values are general merchandise, tobacco, cotton goods, lumber, oysters and clams, farm produce, fish, railroad ties, canned goods, fertilizer, fruits, mine props, cordwood, licorice, wood products, live stock, and pulp wood. The receipts and shipments during 1911 amounted to 186,486 short tons, and were estimated to be worth $10,479,306. Freight rates have not been reduced, at least in recent years.

The depths in the river are ample for the coastwise vessels now carrying on commerce on this stream; therefore further appropriations for this improvement are not recommended.

July 1, 1911, balance unexpended	$4,729.53
Transferred and reallotted to Pamunkey River	1,220.37
	3,509.16
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	3,509.16
Amount (estimated) required to be appropriated for completion of existing project	80,899.87

(*b*) *Mattaponi River.*—The Mattaponi River rises in Virginia, flows in a southeasterly direction for about 120 miles and empties into the York River at West Point, Va. At the time of adoption of the improvement a draft of about 10 feet could be carried at low tide to Walkerton, 29 miles above West Point. Between Walkerton and Aylett, a distance of about 10 miles, there were seven bars with ruling depths varying from 2.4 to 3.8 feet. Besides these bars the river was obstructed by wrecks, logs, snags, and overhanging trees.

The original project for improvement, adopted June 14, 1880, as stated in Annual Report, Chief of Engineers, 1875, volume 2, page 166, provided for the removal of snags, wrecks, and leaning trees below Munday Bridge and the improvement of the bars below Aylett so as to give a depth of 5½ feet at low tide and a channel width of 40 feet, at an estimated cost of $34,059. This project was extended by the terms of the river and harbor act of July 13, 1892, which provided for the removal of snags as far up as Guineys Bridge, 102 miles from the mouth, near Milford Station, on the Richmond, Fredericksburg & Potomac Railroad. The estimated cost of the extended, which is the present, project is $72,100.

Maps of the locality may be found in the Annual Reports of the Chief of Engineers for 1887, 1888, 1890, and 1910.

Reports on examinations and surveys of Mattaponi River, Va., will be found in the Annual Report of the Chief of Engineers for 1875, Part II, page 166, and in House Document No. 311, Sixty-first Congress, second session.

No modifications have been made in the project.

The work of improvement during the fiscal year consisted in rebuilding the dredge *Dalecarlia* and scows for carrying on the improvement. The work of maintenance during the fiscal year consisted in snagging and repairing floating plant.

The total expenditure was $6,599.54, of which $2,195.06 was for maintenance work.

The amount expended on the existing project to June 30, 1912, was $74,053.08, of which $35,686.10 has been applied to maintenance since March 3, 1899. Resulting from this expenditure, channels have been dredged to the full projected dimensions through 13 bars, aggregating about 4.4 miles in length (six bars having been formed since the adoption of the project) within the reach of river between Aylett and 7.4 miles therebelow, making a total of about 107,425 cubic yards of material excavated to date. Sheet pile dikes 2,297 linear feet in length have been constructed at Robinson Bar. Three wrecks, innumerable logs, snags, and overhanging trees have been removed, and the river has been kept free of such obstructions as far as Aylett. Fully 90 per cent of all the work done and expenditure made has been on the 6-mile reach immediately below Aylett.

The work on the project is now about 60 per cent completed, and has been of considerable benefit to commerce.

The maximum draft that could be carried at mean low water over the shoalest part of the channel June 30, 1912, was 4 feet. The mean range of tide is about 3.5 feet. The Mattaponi River is navigable for small steamers and vessels from its mouth to Aylett, about 39 miles above, and navigable for small lighters and rafts from Aylett to Munday Bridge, 16 miles farther.

The principal articles of commerce in the order of their relative values are general merchandise, lumber, farm produce, oysters, railroad ties, mine props, fertilizer, cordwood, canned goods, live stock, logs, pulp wood, and pickles. The receipts and shipments during 1911 amounted to 73,540 short tons and were estimated to be worth $1,073,966.

It is understood that shipments have been facilitated and that freight rates have been somewhat reduced.

The funds, $6,000, asked for for the fiscal year 1914 will be applied to redredging, snagging, and maintenance of improvement.

July 1, 1911, balance unexpended		$18,627.77
Received from sale of condemned property, 1912		10.00
Received from sale of steamer *Gen. Warren*		500.00
		19,137.77
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$4,404.48	
For maintenance of improvement	2,195.06	
		6,599.54
July 1, 1912, balance unexpended		12,538.23
July 1, 1912, outstanding liabilities		309.05
July 1, 1912, balance available		12,229.18
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		10,000.00
Amount available for fiscal year ending June 30, 1913		22,229.18
July 1, 1912, amount covered by uncompleted contracts		4,563.00
Amount (estimated) required to be appropriated for completion of of existing project		[1] 21,193.79
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		([2])

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[1] Exclusive of amount available for fiscal year 1913.

[2] See consolidated money statement on page 384.

(c) *Pamunkey River.*—The Pamunkey River rises in Virginia, flows in an easterly direction about 130 miles, and empties into the York River at West Point, Va. At the time of the adoption of the project for the improvement of Pamunkey River, a draft of 7 feet could be carried at low tide to Buckland Bar, 38½ miles above its mouth. Between this bar and Bassett Ferry, a distance of 8½ miles, there were five bars, the ruling depths on which varied from 2½ to 5½ feet. Besides these bars the river was obstructed by wrecks, logs, snags, and overhanging trees.

The original, which is also the existing, project for the improvement of this river was adopted June 14, 1880, and, as modified in 1885 and 1908, contemplates securing a channel 7 feet deep and 100 feet wide between Bassett Ferry and the mouth of the river, 47 miles. This result is to be obtained by dredging and the construction of dikes, the latter being also designed to secure the dredged material deposited behind them. Wrecks, snags, logs, and trees obstructing navigation are also to be removed. The estimated cost of the revised project is $55,000, and it is estimated that the cost of maintenance will be $4,000 every four years, or an average of $1,000 annually.

Maps of the locality may be found in the Annual Reports of the Chief of Engineers for 1887, 1888, and 1890.

A report on the examination and survey of the Pamunkey River, Va., upon which the project is based, will be found in the Annual Reports of the Chief of Engineers for 1875, Part II, page 162; 1880, page 904, and 1895, page 1250, covering the river from its mouth to Hanovertown, a distance of 59 miles.

The work of improvement during the fiscal year consisted in dredging 2,280 linear feet of channel and 20,004 cubic yards of material and in the reconstruction of dredge *Dalecarlia.* The work of maintenance during the fiscal year consisted in redredging parts of channel previously dredged, in snagging, and in repairing and fitting up floating plant. The total expenditure was $4,655.37, of which $3,372.04 was for maintenance work.

The amount expended on the existing project to June 30, 1912, was $50,826.26, of which $14,908.33 was applied to maintenance after March 3, 1899. This expenditure has resulted in dredging channels through all the bars to the 7-foot depth, but varying in width from 70 feet to the projected width of 100 feet, the aggregate length of these channels being about 1½ miles and the amount of excavation to date about 66,682 cubic yards; in the construction of 1,478 linear feet of sheet-pile dikes at Spring and Skidmore Bars; in the construction of 14 permeable spur dikes at Buckland and Hogan Bars, aggregating in length 2,332 linear feet; in removing eight wrecks, and in removing snags and similar obstructions from about 50 miles of river and keeping it free from such obstructions.

The work of the project is now about 80 per cent completed and has been of considerable benefit to commerce. It is understood that shipments have been facilitated.

The maximum draft that could be carried on June 30, 1912, at mean low tide over the shoalest part of the locality under improvement was 6 feet. The mean range of tide is about 3½ feet. Bassett Ferry, 47 miles above the mouth of the river, is the head of navigation for vessels drawing 7 feet, and navigation by small lighters and rafts extends about 15 miles above.

The principal articles of commerce, in the order of their relative values, are lumber, railroad ties, mine props, cordwood, pulp wood, grain, fertilizer, piles, and logs. The receipts and shipments during 1911 amounted to 52,649 short tons and were estimated to be worth $310,386.

It is understood that freight rates have been reduced.

The funds, $3,000, required for the fiscal year 1914 will be applied to maintenance of the work already done.

July 1, 1911, balance unexpended		$14,237.70
Received from sale of steamer *Gen. Warren*		500.00
Received by transfer from allotment for York River		1,220.37
		15,958.07
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$2,967.58	
For maintenance of improvement	4,996.38	
		7,963.96
July 1, 1912, balance unexpended		7,994.11
July 1, 1912, outstanding liabilities		458.94
July 1, 1912, balance available		7,535.17
July 1, 1912, amount covered by uncompleted contracts		6,505.00
Amount (estimated) required to be appropriated for completion of existing project		[1] 12,762.30
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		([2])

(*d*) *Occoquan Creek.*—Occoquan Creek rises in Virginia, flows about 50 miles in a generally southeasterly direction, and empties into the Potomac River about 28 miles below Washington, D. C. At the time of adoption of the improvement, navigation in Occoquan Creek was obstructed by three bars, over which but 1.2 feet could be carried at low tide. Aside from these obstructions, the creek was amply wide and deep at low tide for vessels drawing up to 5 feet.

The original project for improvement, adopted by river and harbor act of March 3, 1873, was in accordance with plan printed in Senate Document No. 25, Forty-second Congress, third session, and as modified in 1879 provided for dredging channels 100 feet wide and 5 feet deep through the bars below the town of Occoquan, and the construction of a dike at Sand Bar, at an estimated cost of $25,000. Four appropriations were made from 1873 to 1878, aggregating $25,000, and in 1880 the improvement was regarded as completed.

The existing project for this stream, adopted September 19, 1890, and extended by act of March 2, 1907, is in accordance with plan printed in House Document No. 75, Fifty-first Congress, first session (which contains maps), and in Annual Report of the Chief of Engineers for 1873, page 819, and contemplates the dredging of channels 6 feet deep through the five bars obstructing 6-foot navigation below the town of Occoquan, 6 miles above the mouth. These channels are to be 100 feet wide, except through the outer bar and the lower 2,000 feet of the bar next above it, where the channel is to be 150 feet wide. Dikes are to be constructed at the upper three bars. The estimated cost of the project as modified is $64,000.

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[1] Exclusive of the balance unexpended July 1, 1912.

[2] See consolidated money statement on page 384.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Through five bars obstructing 6-foot navigation below Occoquan.					1878 [1]	819- 821 825- 826
Do					1890 [1]	1089-1096
Occoquan to mouth	House	[1] 190	Fifty-ninth	First		
Do					1897 [1]	1822
Do	do	[2] 75	Fifty-first	do		
Do	Senate Ex.	[1] 25	Forty-second	Third		

[1] No maps.

[2] Contains maps.

No modification has been made in the existing project since its adoption.

The work of improvement during the fiscal year was an extension of 257 feet to the jetty at Sand Bar, and the work of maintenance was repairing the jetty, building and repairing floating plant. The total expenditure was $2,465.79, of which $1,770.10 was for maintenance work.

The amount expended under the existing project to June 30, 1912, was $70,099.41, of which $25,672.27 was applied to maintenance subsequent to March 3, 1899. As a result of this expenditure, channels of the full projected dimensions have been dredged through all of the bars and redredged where shoaling occurred, and 2,220 linear feet of dike have been constructed at Occoquan Bar and Sand Bar and repaired where injured by freshets and ice. The aggregate amount of excavation is about 414,499 cubic yards, and dikes at Occoquan and Sand Bars have an aggregate length of 2,220 feet and contain 7,826.6 cubic yards of riprap.

All work provided for in the project has been done, except dike called for at Upper Mud Bar, the construction of which is not at present necessary. The benefits to navigation derived from this improvement are marked. Tugboats and vessels of 6-foot draft can now enter the creek on mean low tide.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 6 feet. The mean range of tide is about 2 feet. The town of Occoquan is the head of navigation. At Occoquan, rapids and falls begin and navigation ceases.

The principal articles of commerce in the order of their relative values are railroad ties, lumber, piles, grain, general merchandise, fish and oysters, fertilizer, cordwood, sugar, and oils.

The receipts and shipments during 1911 amounted to 32,297 short tons and were estimated to be worth $120,845.

Freight rates have been reduced.

The funds, $6,000, asked for for the fiscal year 1914, are for redredging, repairs to jetties, and maintenance of work already done.

July 1, 1911, balance unexpended		$2,465.79
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$695.69	
For maintenance of improvement	1,770.10	
		2,465.79
Amount (estimated) required to be appropriated for completion of existing project		[1] 20,014.71
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		([2])

CONSOLIDATED.

July 1, 1911, balance unexpended		40,060.79
Received from sale of condemned property		10.00
Received from sale of steamer *Gen. Warren*		1,000.00
		41,070.79
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$8,067.75	
For maintenance of improvement	12,470.70	
		20,538.45
July 1, 1912, balance unexpended		20,532.34
July 1, 1912, outstanding liabilities		767.99
July 1, 1912, balance available		19,764.35
Amount appropriated by river and harbor act approved July 25, 1912		10,000.00
Amount available for fiscal year ending June 30, 1913		29,764.35
July 1, 1912, amount covered by uncompleted contracts		11,068.00
Amount (estimated) required to be appropriated for completion of existing project		[1] 134,870.67
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 15,000.00

(See Appendix K 9.)

10. Rappahannock River, Va.—Rappahannock River rises in Virginia in the Blue Ridge Mountains, flows in a general southeasterly direction, and empties into Chesapeake Bay about 40 miles above Fortress Monroe. The river is tidal from the mouth to Fredericksburg, a distance of 106 miles; 6 miles above Fredericksburg there are extensive falls, and from the falls to the source, a distance of about 100 miles, the river is not navigable on account of rapids and shoals. The lower 70 miles of the river is generally a wide and deep body of water, having the characteristics of a tidal estuary rather than of a fluvial stream.

The obstructions to navigation before improvement was undertaken consisted of 9 bars in the upper portion of the river between Tappahannock and Fredericksburg, over which the ruling depths were from 4 to 8½ feet. Seven of the bars were in the 12½ miles reach of river below Fredericksburg. Of these bars Fredericksburg Bar, with a least depth of 4 feet, and Spottswood Bar, 4 miles below Fredericksburg, with a least depth of 6 feet, caused the most delay to steamboats and vessels.

The project for this improvement was adopted March 3, 1871, in accordance with plan printed in House Document No. 60, Forty-first Congress, third session, which contains maps, and in Annual Report of the Chief of Engineers for 1906, page 110, and as modified in 1879 and 1905, forms the existing project, which provides for securing a channel 12 feet deep and 100 feet wide between Fredericksburg and Port Royal and 12 feet deep and 200 feet wide between Port Royal and the mouth of the river, this result to be obtained by dredging and the construction of dikes, the latter being also designed to secure the excavated material deposited behind them.

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[1] Exclusive of amount available for fiscal year 1913.
[2] See consolidated money statement on this page.

The total estimated cost of the revised project was $363,288.86, exclusive of work properly chargeable to maintenance and estimated in 1905 to cost $38,500. The project on which this estimate was based was adopted by Congress by act approved March 2, 1907. This act authorized an expenditure of $90,000 in excess of the amounts therein and theretofore appropriated. This makes the limit of cost of the revised project $393,633.12, including all necessary work properly chargeable to maintenance on June 30, 1907. This contract authorization of $90,000 has since been appropriated. The estimated annual cost for further maintenance is $10,000.

Maps of this locality may be found in the Annual Reports of the Chief of Engineers for 1880, 1881, 1883, 1886, 1887, 1888, 1890, 1906, 1909, and 1910.

A report on examination and survey of Rappahannock River, Va., will be found in House Document No. 60, Forty-first Congress, third session, and a report of the survey submitting the revised project will be found in the Annual Report of the Chief of Engineers for 1906, pages 1110–1112.

The work of the fiscal year consisted of redredging, protection for sand fills, the reconstruction of dredge *Dalecarlia*, and repairing floating plant. The expenditure incidental thereto, amounting to $9,295.13, was applied to maintenance.

The amount expended to June 30, 1912, was $545,967.20, of which $135,141.14 has been applied to maintenance since March 3, 1899. The sum of $59,933.18 was expended prior to March 3, 1899, in redredging freshet deposits and in repairs to dikes.

The following sums have been obtained from other sources than appropriations: Damages recovered from contractor's sureties, $1,000, and proceeds of sale of property, $135; total, $1,135, which was deposited with the funds for improving the Rappahannock River.

The expenditure has resulted in the completed improvement of the 20 bars between Fredericksburg and the mouth of the river by means of dredging and rock excavation, construction of dikes, and removal of two wrecks which obstructed navigation. About 1,297,565 cubic yards of material has been dredged, 1,537 cubic yards of rock excavated, 33,800 linear feet of dikes constructed, 8,728 linear feet of dikes repaired, 1,906 linear feet of riprap dike constructed, and 3,625 cubic yards of riprap stone used.

All work of the approved project has been completed, but it is estimated that an average annual expenditure of $10,000 will be required to keep the channels open and keep the work previously done in repair.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 10 feet. The mean range of tide is about 3 feet. Fredericksburg, 106 miles above the mouth, is the head of navigation for steamers and barges. Falmouth, 3 miles farther up, is the head of navigation for small scows, lighters, and launches.

The principal articles of commerce in the order of their relative values are general merchandise, farm produce, oysters, railroad ties, lumber, corn, flour, hay and feed, fertilizer, canned goods, live stock, fish, grain, mine props, clothing, and pulp wood. The receipts and shipments during 1911 amounted to 220,333 short tons and were estimated to be worth $6,368.098.

The work has been of benefit to commerce, and has afforded the coastwise trade access to the upper portion of the river.

It is understood that freight rates in the last few years have been increased.

At Fredericksburg Bar new deposits of sand are formed by each recurring freshet, and shoaling is also constantly taking place, though less rapidly, at some of the lower bars.

It is proposed to apply the additional appropriation recommended in removing these deposits and repairing the dikes, if needed, for the purpose of maintenance and preservation of the work already done.

July 1, 1911, balance unexpended	$19,691.93
Received from sale of condemned property	78.00
Received from sale of steamer *Gen. Warren*	500.00
	20,269.93
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	9,295.13
July 1, 1912, balance unexpended	10,974.80
July 1, 1912, outstanding liabilities	420.00
July 1, 1912, balance available	10,554.80
Amount appropriated by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	15,554.80
July 1, 1912, amount covered by uncompleted contracts	8,280.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]25,000.00

(See Appendix K 10.)

11. Urbana Creek, Va.—Urbana Creek, rising in Virginia, of a total length of 4¾ miles, is a tidal stream, having few fluvial characteristics, entering the Rappahannock River from the right bank about 18 miles from Chesapeake Bay. Before the improvement a bar existed outside the mouth, over which but 6½ feet could be carried at low tide, and there was a shoal within the creek with a ruling depth of 7 feet.

The project for this improvement, adopted March 3, 1879, and modified in 1883, 1888, and 1897, provides for dredging a channel 150 feet wide and 10 feet deep through the outer and inner bars, with a turning basin of the same depth at the head of steamer navigation, three-fourths of a mile from deep water in the Rappahanock; for a series of spur dikes at Bailey Point, and for a stone jetty to protect the cut through the outer bar. The final revised estimate of cost is $70,000.

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[1] Exclusive of amount available for fiscal year 1913.

A report on examination and survey of Urbana Creek, Va., upon which the project is based, will be found in the Annual Report of the Chief of Engineers for 1875, volume 2, page 139, which does not contain maps.

Maps of this locality may be found in the Annual Reports of the Chief of Engineers for 1889 and 1890.

The work of improvement during the fiscal year consisted in extending the jetty. The work of maintenance consisted in repairing the jetty and floating plant. The expenditure was $6,117.94, of which $1,547.34 was applied to maintenance.

The amount expended to June 30, 1912, was $58,852.41, of which $21,951.51 has been applied to maintenance since March 3, 1899. As a result of this expenditure a channel through the bars, aggregating about nine-tenths of a mile in length, has been dredged 10 feet deep and 150 feet wide; a turning basin at the steamboat wharf has been dredged 10 feet deep and about 400 feet wide; and some redredging has been done in the channels and turning basin where shoaling has occurred; the total amount of material dredged to date is about 164,361 cubic yards. Harbor lines have been established and 1,895 linear feet of stone jetty have been completed by the placement of 3,937.4 cubic yards of riprap.

The work of the project was about 97 per cent completed; has been of benefit to commerce, allowing shipments to be made from Urbana. The freight rates, however, have been advanced in the last few years.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the locality under improvement was about 10 feet. The mean range of tide is 1.5 feet. The town of Urbana, at the mouth of the creek, is the head of navigation for steamers and large vessels, while small vessels ascend the stream for a distance of 3 or 4 miles.

The principal articles of commerce in the order of their relative values are general merchandise, oysters, farm produce, manufactured clothing, lumber, wood and wood products, flour, machinery, live stock, canned goods, and oils. The receipts and shipments during 1911 amounted to 21,810 short tons, and were estimated to be worth $429,920.

As the funds now available are sufficient to complete the work provided for under the present project, and probably provide for some maintenance, no further appropriation is at present recommended.

July 1, 1911, balance unexpended		$13,265.53
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$4,570.60	
For maintenance of improvement	1,547.34	
		6,117.94
July 1, 1912, balance unexpended		7,147.59
July 1, 1912, outstanding liabilities		220.00
July 1, 1912, balance available		6,927.59

(See Appendix K 11.)

12. *Harbor at Milford Haven, Va.*—The harbor at Milford Haven is a tidal estuary of Chesapeake Bay, about 4 miles long and from one-half to 1 mile wide and about 35 miles from Fort Monroe. The depth in the channel ranges from 6½ to 14 feet, and in the portion navigated by steamers is generally 9 feet or more. The haven has

two entrances, one at the northwest end from Hills Bay, an arm of Piankatank River, and another at the southeast end from Chesapeake Bay. Both entrances before improvement was made were obstructed by bars. The southeast entrance is exposed, and, as the bar has a ruling depth of but 3 feet, is seldom used. The bar which obstructed the northwest entrance had, before improvement, a ruling depth of 8 feet. A bar also existed within the haven between Cricket Hill and Callis Wharves, with a ruling depth of about 8 feet.

The project for this improvement was adopted March 3, 1899, in accordance with plan printed in House Document No. 299, Fifty-third Congress, third session, which contains map, and in Annual Report of the Chief of Engineers for 1895, pages 1267–1270, and provides for dredging the channel at the entrance to a minimum width of 200 feet and a depth of 10 feet at low tide, at an estimated cost of $12,500. The act of Congress approved June 6, 1900, added to the project the improvement of a bar within the said harbor. In 1908 a jetty was added at the northwest entrance, 333 feet long, to aid in maintaining the outer channel, the estimated cost for the completion of the project at this time being $17,500; and in 1909 the length of this jetty was increased 800 feet, at an estimated cost of $10,000.

The existing project, therefore, provides for dredging channels 10 feet deep by a minimum width of 200 feet through the bars at the northwest entrance and between Cricket Hill and Callis Wharves, and for the construction of a jetty 1,133 feet long at the northwest entrance at a total estimated cost of $27,500.

For reasons given in the Annual Report of the Chief of Engineers for 1909, page 1241, it was recommended that the existing jetty be extended about 800 feet at an estimated additional cost of $10,000, as an aid in maintaining the dredged channels. This recommendation was approved by the Board of Engineers for Rivers and Harbors and the Chief of Engineers.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Bar at mouth					1893 [1]	1319–1321
Bar at northwest entrance from Piankatank River.					1895 [1]	1267–1270
Bar at mouth	House	[1] 59	Fifty-second	Second		
Bar at northwest entrance from Piankatank River.	do	[2] 299	Fifty-third	Third		

[1] No maps. [2] Contains map.

The work during the fiscal year consisted in extending the jetty 565 linear feet, and the expenditure ($4,435.75) was applied to maintenance.

The amount expended to June 30, 1912, was $25,024.23, of which $4,662.72 was applied to maintenance. (The expenditure for the construction of jetty is included in maintenance.) The sum of

$3,032.97, recovered as a judgment from a failing contractor, was also expended on the improvement.

Resulting from this expenditure, channels of the full projected dimensions have been dredged and redredged through both bars for a total length of forty-eight one-hundredths mile, and a stone jetty 898 feet long has been constructed to maintain the outer channel. The amount of material excavated from the channels was 57,727.3 cubic yards, and the amount of riprap used in the construction of the jetty was 1,693.3 cubic yards.

The work of the project is completed except the construction of jetty, which is considered a maintenance feature. Commerce has been considerably benefited by the work.

The maximum draft that could be carried June 30, 1912, at mean low tide over the shoalest part of the locality under improvement was 10 feet. The mean range of tide is about 1.3 feet. The haven is navigable throughout its entire length by vessels drawing 6 feet, and Fitchetts Wharf, about 3 miles above the northwest entrance, is the highest point reached by the large steamers.

The principal articles of commerce in the order of their relative values are general merchandise, fish, oysters, farm produce, flour, fertilizer, crabs, piles, lumber, hay and feed, and grain. The receipts and shipments during 1911 amounted to 12,163 short tons, and were estimated to be worth $647,688.

Freight rates have been advanced.

It is proposed to apply the funds ($5,000) appropriated by the river and harbor act of July 25, 1912, to the completion of the jetty and redredging. Further appropriations will not be needed for several years.

July 1, 1911, balance unexpended	$5,386.68
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	4,435.75
July 1, 1912, balance unexpended	950.93
Amount appropriated by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	5,950.93

(See Appendix K 12.)

13. Removing sunken vessels or craft obstructing or endangering navigation. (*a*) *Wreck of schooner in the Potomac River at Mathias Point, Va.*—This wreck was reported on June 23, was examined on July 13, and was found to be no material obstruction to navigation, and accordingly was not removed.

The expenditure for the examination was $50.

(*b*) *Wreck of schooner "Plumie E. Smith," in Virginia Channel, Potomac River, at Washington, D. C.*—This wreck was caused by a collision with the steamer *City of Milford* on June 9, and was abandoned by the owner on July 30. An allotment of $300 was made for the removal on August 4, and the removal was accomplished between August 22 and 29. The expenditure for the removal was $260; the balance of $40 was returned to the Treasury on October 14.

(*c*) *Wreck of the schooner "Lizzie Bell," in the Rappahannock River, Va., at Fredericksburg, Va.*—This wreck became a menace to navigation after the freshet of August 31 and was so reported on September 19. An allotment of $300 was made for its removal on

September 25, and the removal was accomplished between October 2 and 9.

The expenditure for the removal was $300, the full amount of the allotment.

(*d*) *Wreck of the schooner "Itinerant" at the mouth of the Great Wicomico River, Va.*—This wreck was reported on September 29, was examined on October 12, an allotment of $50 was made for the examination on October 5, and allotment of $800 was made for removal on October 26. The removal was accomplished during November.

The expenditure for the examination and removal was $686.24, and the balance, $163.76 of the allotments, was returned to the Treasury on December 21.

(*e*) *Wreck of schooner in Nomini Creek, Va., near Nomini Ferry.*—This wreck, as reported, was found to be a menace to navigation. An allotment of $200 was made for the removal on April 9, but no work was done or expenditure made during the fiscal year.

(*f*) *Wreck of Barge Float No. 1 in Mobjack Bay, Va.*—This wreck, as reported, was found to be a menace to navigation. An allotment of $1,000 was made for the removal on May 28, but no work was done or expenditure made during the fiscal year.

(See Appendix K 13.)

EXAMINATIONS AND SURVEYS REQUIRED BY THE RIVER AND HARBOR ACTS APPROVED JUNE 25, 1910, AND FEBRUARY 27, 1911.

Reports dated October 24, 1910, and June 16, 1911, with map, on preliminary examination and survey, respectively, of *Aquia Creek, Va., from Coals Landing to the mouth*, required by the river and harbor act approved June 25, 1910, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 579, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $21,400 for first construction, with $1,000 annually for maintenance, is presented.

The local officer was also charged with the duty of making other preliminary examinations and surveys, provided for by the river and harbor acts of June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. Archers Hope River, Va., with a view to securing increased depth from its mouth to Williamsburg.

2. Potomac River at Colonial Beach, Va., with a view to a proper approach to the landing place.

IMPROVEMENT OF RIVERS AND HARBORS IN THE NORFOLK, VA., DISTRICT.

This district was in the charge of Lieut. Col. Mason M. Patrick, Corps of Engineers, until July 19, 1911; in the charge of Lieut. Col. W. C. Langfitt, Corps of Engineers, to December 6, 1911; and in charge of Lieut. Col. Patrick since that date. Division engineer: Col. Dan C. Kingman, Corps of Engineers.

1. Harbor at Norfolk, Va.—(*a*) *General improvement.*—The city of Norfolk, Va., lies on the Elizabeth River and its branches about

9 miles from its mouth in Hampton Roads. The improvement of its harbor has included the improvement of the channel of the main river for this length of 9 miles and, in addition, the improvement of each of its three branches for a distance of about 1 mile from their junction with the main river, and also the dredging of an anchorage basin at the mouth of the Western Branch, having an area of 56 acres and a depth of 25 feet at mean low water. Norfolk is 37 miles by water southwest of Cape Charles City Harbor, Va., and 187 miles by water south of Baltimore, Md.

In its original condition the main channel of this harbor was at mean low water navigable by vessels of 20 feet draft as far as the navy yard on the Southern Branch of the Elizabeth River, while in the Eastern Branch of this river there was a channel 15 feet in depth at mean low water as far as the Campostella Bridge. These channels were of varying width.

The original project of improvement was adopted in 1878, revised in 1885, and amended in 1890, 1898, and 1905. It included the attainment of a channel from 500 to 700 feet wide and 25 feet deep at mean low water from Hampton Roads to the navy yard, a distance of about 10 miles, a branch channel 22 feet deep at the same stage of the tide, to the Campostella Bridge on the Eastern Branch, a distance of about 1 mile, and, within the limits of the first-named channel, a channel 450 feet wide and 28 feet deep at mean low water from deep water in Hampton Roads to the navy yard. There has also been included in the project the excavation of an anchorage at the mouth of the Western Branch, having an area of 56 acres and a depth of 25 feet at mean low water, and the dredging, to the depth of 28 feet at mean low water, of the area between the western edge of the main channel and a line 75 feet outside of the established pierhead line, along the railroad docks at Pinner Point. The cost of all this work was estimated at $1,623,790.98.

The existing project of improvement is the original project, modified from time to time as stated above, under which the first appropriation for work was made August 14, 1876.

The original project of improvement, modified from time to time as stated above, has been entirely completed.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Hampton Roads to Norfolk					1880 [1]	815
Eastern Branch					1885 [1]	1007
Junction of Eastern and Southern Branches to navy yard.					1887 [1]	968
Harbor and Eastern and Southern Branches.					1893 [1]	1828
At Pinners Point	House [2]	74	Fifty-sixth	Second		
Norfolk Harbor and Eastern, Southern, and Western Branches	House [1]	373	Fifty-ninth	First		

[1] Contains maps.

[2] No maps.

During the fiscal year no work was done. The expenditures were for the payment of retained percentages.

To June 30, 1912, there had been expended on this project $1,674,361.13, of which sum $51,956.07 was for work of maintenance. The sum of $38.21 has been derived from the sale of property and blue prints.

The completion of the approved project increased the depth in the main channel of the harbor at mean low water to 28 feet from Hampton Roads to the navy yard, a distance of about 10 miles. The depth in the channel of the Eastern Branch is 22 feet to the Campostella Bridge, about 2 miles from its mouth. Above this bridge it has not been improved, but in the natural channel a draft of about 10 feet can be carried to a point some 4 miles from its mouth.

The normal tidal range is 2.7 feet.

For the calendar year 1911, the water-borne shipments aggregated 14,445,112 short tons, value not known. The chief products handled are coal, cotton, fertilizer, forest and agricultural products, and general merchandise. The improvement has made Norfolk an important shipping point for bituminous coal from the West Virginia fields.

It has not been found practical to ascertain what effects, if any, the improvement has had on freight rates.

The amount estimated for expenditure in the fiscal year 1914 will be applied to dredging, if necessary, to maintain the project depth and width of the channel.

July 1, 1911, balance unexpended		$5,904.07
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$324.51	
For maintenance of improvement	61.06	
		385.57
July 1, 1912, balance unexpended		5,518.50
Amount appropriated by river and harbor act approved July 25, 1912		4,000.00
Amount available for fiscal year ending June 30, 1913		9,518.50
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1]5,000.00

(*b*) *Hospital Point.*—The land of this point is the property of the United States, and a part of the grounds used by the Navy Department as a site for a hospital. The main channel of Norfolk Harbor passes in front of and close to this point.

The project for this work, adopted June 13, 1902, required the cutting off of 450 feet of the point, the construction of a sea wall and wharf, and the dredging of the area on both sides of the old point for a total distance of about 1 mile. The depth to be secured in the dredging was to be the same as that of the harbor—25 feet at mean low water. The estimated cost of the work was $193,957, all of which has been appropriated.

No modification of the original project, since its adoption, has been made.

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[1] Exclusive of amount available for fiscal year 1913.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Hospital Point					[1] 1889	964
Do					[2] 1897	1365

[1] No maps.

[2] Contains maps.

During the fiscal year no work was done. The expenditures were for the payment of retained percentages. The project has been entirely completed.

To June 30, 1912, there had been expended on this project $198,957, of which sum $11,392.39 was for work of maintenance.

The statements in the previous section of this report regarding the character and volume of the commerce affected by the improvement of Norfolk Harbor, and as to the tidal range, and the effect of the improvement on freight rates apply to this section also.

July 1, 1911, balance unexpended	$447.00
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	447.00

(*c*) *Thirty-foot channel.*—As noted in section (*a*) preceding, the existing ship channel had been deepened to 28 feet for a width of 450 feet, from Hampton Roads to the junction of the Southern and Eastern Branches.

Under a project adopted March 2, 1907, this ship channel has been deepened to 30 feet for a width of 600 feet from Hampton Roads to Lamberts Point, a distance of about 6 miles, and 800 feet from Lamberts Point to the junction of the Eastern and Southern Branches of the Elizabeth River, a farther distance of about 3 miles. This project also included the removal of the shoals at the mouth of the Eastern Branch to a depth of 25 feet and a width of 500 feet. The estimated cost of the project was $1,132,000.

Reports, with maps, upon examinations of this improvement will be found in House Documents Nos. 373 and 381, Fifty-ninth Congress, first session.

No modification of the original project, since its adoption, has been made.

During the fiscal year no work was done, and the expenditures were for the purchase of a launch to replace one worn out on the work, and for office expenses.

The expenditures to June 30, 1912, have amounted to $684,337.89, and have resulted in the completion of the project.

The sum of $63.40 has been received from sales.

It appears that this improvement has benefited the commerce of the harbor at Norfolk, Va., as the commercial statistics for the calendar year 1911 show an increase over the preceding year.

The statements in section (*a*) preceding, regarding the character and volume of commerce and tidal range, and the effect of the improvement on freight rates, apply to this section also. On June 30, 1912, vessels of 30-foot draft could proceed from deep water in Hampton Roads to the navy yard.

The balance available will be used for maintenance and for the renewal of Government plant worn out on the work.

July 1, 1911, balance unexpended	$24,766.30
Reimbursed by the Isthmian Canal Commission	28.73
	24,795.03
June 30, 1912, amount expended during fiscal year, for works of improvement	2,040.79
July 1, 1912, balance unexpended	22,754.24
July 1, 1912, outstanding liabilities	125.00
July 1, 1912, balance available	22,629.24

(*d*) *Anchorage at and near Lamberts Point.*—The project adopted by the river and harbor act of June 25, 1910, provided for dredging over an area of about 22 acres abreast of and north of Lamberts Point, at an estimated cost of $30,000, to increase the space for anchorage, in accordance with report printed in House Document No. 551, Sixty-first Congress, second session.

This oblong area had a minimum depth of 20 feet at mean low water and lies between the old and new channels of Norfolk Harbor, the south end of the area being about 750 feet off the north coal pier of the Norfolk & Western Railway. The north end of the area is about 3,400 feet from that point.

Reports, with map, upon an examination and survey of this locality are printed in House Document No. 551, Sixty-first Congress, second session.

No modification of the original project since its adoption has been made.

During the fiscal year no work was done and the expenditures were for the payment of retained percentages and for office expenses.

To June 30, 1912, there had been expended on this project $23,393.38, and the project has been completed.

The statements in section (*a*) regarding the character and volume of the commerce affected by the improvement of Norfolk Harbor and as to the tidal range and the effect of the improvement on freight rates apply to this section also.

It is believed that no maintenance work will probably be required, but the balance available should be retained until a survey is made to determine whether any shoaling has taken place.

July 1, 1911, balance unexpended	$8,858.30
June 30, 1912, amount expended during fiscal year, for works of improvement	2,251.68
July 1, 1912, balance unexpended	6,606.62

(See Appendix L 1.)

2. Harbor at Norfolk and the approaches thereto and the channel to Newport News.—(*a*) *Harbor at Norfolk and the approaches thereto.*—For the original conditions, date of original project, its modifications, the scope of the improvement, and the amount expended thereunder, see sections (*a*), (*b*), (*c*), and (*d*) of the current summary upon harbor at Norfolk, Va.

The existing project for improvement adopted by the river and harbor act of June 25, 1910, provides for dredging a channel 400 feet wide and 35 feet deep at mean low water from deep water in Hampton Roads to the navy yard at Portsmouth, Va., a distance of about 11 miles, at an estimated cost of $800,000.

Reports upon an examination and survey of this improvement are printed in House Document No. 551, Sixty-first Congress, second session; no maps.

No modification of the existing project since its adoption has been made.

The dredging in the reach between the Belt Line Railway bridge and the junction of the Eastern and Southern Branches, which was in progress at the close of the last fiscal year, was completed to the project width and depth. The channel was also completed to the project width and depth in reaches Nos. 1 and 2 between the junction of the branches and Lamberts Point, a distance of about 3 miles, and to the project depth for a width of 200 feet for a further distance of 15,700 feet in reach No. 3, between Lamberts Point and Bush Bluff Lightship.

The sum of $231,784.49 was expended during the fiscal year for dredging and contingencies.

The expenditures on the existing project to June 30, 1912, have amounted to $329,687.49.

The sum of $63.03 has been received from sales.

The dredging is being done under a continuing contract, and the balance of the authorization remaining to be appropriated is $175,000.

At the close of the fiscal year work was still in progress, and the adopted project was about 59 per cent completed.

The statements contained in section (*a*) of the current summary upon harbor at Norfolk, Va., regarding the character and volume of commerce, tidal range, and the effect of the improvement on freight rates apply also to this improvement. On June 30, 1912, vessels of 30 feet draft could proceed from deep water in Hampton Roads to the navy yard.

The amount required for expenditure during the fiscal year ending June 30, 1914, will be applied to dredging for the purpose of continuing the improvement.

July 1, 1911, balance unexpended	$292,120.03
Received from sales	40.00
	292,160.03
June 30, 1912, amount expended during fiscal year, for works of improvement	231,784.49
July 1, 1912, balance unexpended	60,375.54
July 1, 1912, outstanding liabilities	42,609.07
July 1, 1912, balance available	17,766.47
Amount appropriated by sundry civil act approved Aug. 24, 1912	165,000.00
Amount available for fiscal year ending June 30, 1913	182,766.47
July 1, 1912, amount covered by uncompleted contracts	293,237.14

Amount of continuing contract authorization, act of Feb. 27, 1911	$340,000.00
Amount appropriated under such authorization	165,000.00
Amount yet to be appropriated	175,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 245,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 238,000.00

NOTE.—$185.16 expended for inspection of material for the Isthmian Canal Commission, and for which reimbursement has been requested, not included in the above money statement.

(*b*) *Thimble Shoal.*—This shoal extends from a point about 1¼ miles eastward of Thimble Shoal Lighthouse, Chesapeake Bay, in a southeast direction, toward the entrance to the bay from the ocean. It is about 5 miles long, with a minimum depth of 30 feet at mean low water.

The existing project for the improvement, adopted by the river and harbor act of June 25, 1910, provides for dredging a channel about 5 miles long, 500 feet wide, and 35 feet deep at mean low water, at an estimated cost of $660,000, in accordance with report printed in House Document No. 551, Sixty-first Congress, second session.

No modification of the existing project, since its adoption, has been made.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Thimble Shoal	House	[1] 551	Sixty-first	Second		
Do					1911 [2]	1480

[1] No maps. [2] Contains maps.

During the fiscal year dredging was done throughout the channel, and on June 30, 1912, the available channel depth is not less than 33 feet for its entire length and for nearly its entire width. The project on that date is 83 per cent completed.

During the fiscal year a survey was made to determine the amount of work still required on the Thimble Shoal channel, and the result showed that the total amount of material removed and to be removed would be much less than the original estimate, which estimate was based upon information derived from a Coast and Geodetic Survey chart, there being no other data available at the time. The contract price for the work is much lower than was originally estimated, and it now appears that the project can be completed at a total cost of $360,000 instead of $660,000, as originally estimated, a reduction of $300,000.

The sum of $100,881.28 was expended during the fiscal year for dredging and contingencies.

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[1] Exclusive of amount available for fiscal year 1913.

The expenditures to June 30, 1912, have amounted to $159,869.36.

On June 30, 1912, a vessel drawing 33 feet could pass through Thimble Shoal at mean low water. The range of tide is 2.5 feet.

The commerce passing to and from the ocean between the Virginia capes, bound to and from Norfolk, Va., and Newport News, Va., uses this Thimble Shoal channel. For details as to the commerce of these two harbors, see the current summary; also as to heads of navigation, etc.

The amount recommended for appropriation for the fiscal year ending June 30, 1914, will be applied to dredging for the purpose of continuing the improvement.

July 1, 1911, balance unexpended	$176,011.92
June 30, 1912, amount expended during fiscal year, for works of improvement	100,881.28
July 1, 1912, balance unexpended	75,130.64
July 1, 1912, outstanding liabilities	9,266.77
July 1, 1912, balance available	65,863.87
July 1, 1912, amount covered by uncompleted contracts	53,791.00
Amount (estimated) required to be appropriated for completion of existing project	[1][2] 125,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 125,000.00

(*c*) *South Branch of Elizabeth River.*—This river extends southward in a sinuous course from its junction with the East Branch of the Elizabeth River to the locks of the Albemarle & Chesapeake Canal at Great Bridge, Va., a distance of about 11 miles. At a point about 6 miles above the junction of the branches, Deep Creek joins the South Branch, the former continuing to the locks of the Dismal Swamp Canal, about 3 miles from the junction. The channel depth to the locks of both canals is about 10 feet at mean low water, and prior projects for the improvement of the South Branch covered the dredging of shoals north of the locks at Great Bridge for a distance of about 5 miles under a project for the improvement of the rivers, sound, and bay, forming, in conjunction with the land cuts of the Albemarle & Chesapeake Canal, an inland waterway to Albemarle Sound, N. C.; in the lower reaches of the South Branch the channel has been dredged, first, to 25, then to 28, and then to 35 feet in depth at mean low water, to the navy yard, about 1¼ miles above the mouth, under appropriations for improving the harbor of Norfolk, Va.

In the lower reaches of the South Branch, the natural channel from the Belt Line Railway bridge, about 1½ miles above its mouth, for about 1½ miles upstream, had a depth of about 18 feet at mean low water, and thence to the Norfolk & Western Railway bridge, about 2 miles farther, a depth of about 12 feet at mean low water. Above the Belt Line Railway bridge this channel at many places was very narrow and for its entire length very tortuous.

The project of improvement, adopted by the river and harbor act of June 25, 1910, is to provide, by dredging, a channel from the Belt Line Railway bridge to a point about 1½ miles above, 300 feet wide and 25 feet deep at mean low water, and thence to the Norfolk & Western Railway bridge, a further distance of about 2 miles, 200 feet wide and 22 feet deep at mean low water, at an estimated cost, including the easing of abrupt turns, of $222,500, in accordance with plan printed in House Document No. 551, Sixty-first Congress, second session.

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[1] Exclusive of the balance unexpended July 1, 1912.

[2] Original estimate of cost, $660,000. Cost now estimated to be $360,000, as determined by recent survey (see paragraph above).

No modification of the existing project, since its adoption, has been made.

Reports upon examinations and surveys of this locality are printed as House Documents No. 373, Fifty-ninth Congress, first session, and No. 551, Sixty-first Congress, second session, with map.

During the fiscal year dredging to the project width and depth was done from a point about 1½ miles above the Belt Line Railway bridge to the Norfolk & Western Railway bridge, completing the project.

The amount of material actually removed proving to be less than had been estimated, and the prices obtained for dredging being less than had been expected, the total cost of this project was only $187,500, instead of $222,500 as originally estimated, a reduction of $35,000.

The sum of $81,384.77 was expended during the fiscal year for dredging and contingencies.

The expenditures to June 30, 1912, have amounted to $131,861.69.

During the year work was carried on under a continuing-contract authorization for which the sum of $2,500 still remains to be appropriated, but will not be needed.

The project has been completed.

On June 30, 1912, a draft of 25 feet could be carried at mean low water over the stretch of the river from the Belt Line Railway bridge to a point about 1½ miles above, and for the remainder of the distance to the Norfolk & Western Railway bridge, 22 feet. This river, in connection with private canals and the inland water routes to Albemarle Sound, N. C., is the northern outlet to Chesapeake Bay and Hampton Roads and their tributaries of sounds, bays, and rivers in northeastern North Carolina. The distance from Norfolk by either of the canal routes to Albemarle Sound is about 67 miles, and the depth available in each is about 9 feet at mean low water.

The commerce of the river over the distance covered by the project amounted to about 646,253 short tons in the calendar year 1908, valued at $5,942,855. In the calendar year 1911 it is reported at 695,706 short tons, value not known. The articles transported are coal, forest products, iron, chemicals, oil, and fertilizer. In addition to the tonnage stated, the traffic by way of the two inland waterways, of which the river channel forms a part, in the calendar year 1911 aggregated 674,447 short tons.

It has not been possible to ascertain the effect the improvement has had on freight rates. Its completion, however, has enabled shippers to load and unload vessels alongside their wharves instead of lightering much of the cargoes of incoming and outgoing vessels which formerly had to be anchored, in some cases, at least 4 miles from the wharves. This discontinuance of the necessity for lightering will decrease the cost of loading and unloading vessels.

The amount recommended to be appropriated for the fiscal year ending June 30, 1914, will be applied to maintenance.

July 1, 1911, balance unexpended	$84,523.08
June 30, 1912, amount expended during fiscal year, for works of improvement	81,384.77
July 1, 1912, balance unexpended	3,138.31
Amount appropriated by sundry civil act approved Aug. 24, 1912	50,000.00
Amount available for fiscal year ending June 30, 1913	53,138.31
July 1, 1912, outstanding liabilities	48,278.61
Amount of continuing contract authorization, act of Feb. 27, 1911	52,500.00
Amount appropriated under such authorization	50,000.00
Amount yet to be appropriated	2,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

(*d*) *The channel to Newport News.*—Before any improvement was made of this locality, vessels of 25 feet draft could proceed to Newport News at mean low water. Under a project adopted June 13, 1902, a channel 500 feet wide and 30 feet deep at mean low water was dredged south of Middle Ground Light, in Hampton Roads, Va., through the shoal known as "Middle Ground Bar," the sum of $225,000 having been appropriated and expended therefor. In addition, $12,500 have been applied to maintaining the dredged channel.

The project adopted by the river and harbor act of June 25, 1910, provides for dredging a channel 400 feet wide and 35 feet deep at mean low water, for a distance of about 3¼ miles, through the shoal north of Middle Ground Light, in Hampton Roads, Va., at an estimated cost of $465,000.

No modification of the existing project, since its adoption, has been made.

Reports, with maps, upon an examination and survey of the locality are printed as House Document No. 550, Sixty-first Congress, second session. For other details and references see the current summary for Norfolk Harbor (general improvement).

During the fiscal year dredging was done for a width of 200 feet for the entire length of the channel and for an additional width of 100 feet for a length of about 2 miles. On June 30, 1912, the project was 99.5 per cent completed.

The sum of $135,630.27 was expended during the fiscal year for dredging and contingencies.

The expenditures to June 30, 1912, have amounted to $247,401.51.

During the year work was carried on under a continuing-contract authorization for which the sum of $20,000 still remains to be appropriated, but will not be needed.

This channel is not yet in use, but as soon as the small amount of work remaining to be done is finished and the channel properly marked it will be available for vessels drawing 35 feet. The normal tidal range is 2.7 feet.

For the calendar year 1911 the water-borne shipments to and from Newport News, which this channel will serve, aggregated 6,307,501 short tons. The chief commodities handled are coal, fertilizer, forest and agricultural products, and general merchandise. The completion of this improvement will render much easier and more direct the approach to the harbor of Newport News.

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[1] Exclusive of amount available for fiscal year 1913.

The estimated amount required for expenditure in the fiscal year ending June 30, 1914, will be applied to dredging under the adopted project for maintaining the improvement.

July 1, 1911, balance unexpended	$153,228.76
June 30, 1912, amount expended during fiscal year, for works of improvement	135,630.27
July 1, 1912 balance unexpended	17,598.49
Amount appropriated by sundry civil act approved Aug. 24, 1912	210,000.00
Amount available for fiscal year ending June 30, 1913	227,598.49
July 1, 1912, outstanding liabilities	205,471.44
July 1, 1912, amount covered by uncompleted contracts	16,102.97
Amount of continuing contract authorization, act of Feb. 27, 1911	230,000.00
Amount appropriated under such authorization	210,000.00
Amount yet to be appropriated	20,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 15,000.00

CONSOLIDATED.

July 1, 1911, balance unexpended	$705,883.79
Received from sales	40.00
	705,923.79
June 30, 1912, amount expended during fiscal year, for works of improvement	549,680.81
July 1, 1912, balance unexpended	156,242.98
Amount appropriated by sundry civil act approved Aug. 24, 1912	425,000.00
Amount available for fiscal year ending June 30, 1913	581,242.98
July 1, 1912, outstanding liabilities	305,625.89
July 1, 1912, amount covered by uncompleted contracts	363,131.11
Amount of continuing contract authorization, act of Feb. 27, 1911	622,500.00
Amount appropriated under such authorization	425,000.00
Amount yet to be appropriated	197,500.00
Amount (estimated) required to be appropriated for completion of existing project	[1,2] 697,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	[3] 363,000.00
For maintenance of improvement	20,000.00
Total	[1,3] 383,000.00

NOTE.—$185.16 expended for inspection of material for the Isthmian Canal Commission, and for which reimbursement has been requested, not included in the above money statement.

(See Appendix L 2.)

3. Western Branch of Elizabeth River, Va.—The channel of the river, when the project for improvement was adopted, was 12 feet deep at mean low water and from 50 to 300 feet wide.

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[1] Exclusive of amount available for fiscal year 1913.

[2] This is the unappropriated balance of the original estimate. It is now expected to complete the work for $370,000.

[3] Of this amount $197,500 is for continuing contract work authorized by the act of 1911.

The project adopted June 3, 1896, provided for obtaining, by dredging, a channel 200 feet wide and 20 feet deep at mean low water for a distance of about 1 mile from deep water in Norfolk Harbor. The estimated cost was $45,000, all of which has been appropriated.

No modification of the original project, since its adoption, has been made.

The project adopted by the river and harbor act of February 27, 1911, for "Improving harbor at Norfolk, Va.," provided $5,000 for maintenance of improvement, including this branch. For present adopted project for improving harbor at Norfolk, Va., see House Document No. 551, Sixty-first Congress, second session; for adopted project for the Western Branch of the Elizabeth River, Va., see House Document No. 331, Fifty-fourth Congress, first session.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
From mouth 1 mile	House	[1] 218	Fifty-third	Third	1895 [1]	1300
Do	do	[1] 331	Fifty-fourth	First	1896 [1]	1071
Do	do	[2] 373	Fifty-ninth	do		
Do	do	[1] 551	Sixty-first	Second		
Do	do	[2] 556	Sixty-second	do		

[1] No maps.

[2] Contain maps.

No work was done and no expenditures were made during the fiscal year.

Up to June 30, 1912, the sum of $44,671.65 has been expended on improvement and $5,000 for its maintenance. The project has been completed.

A draft of 20 feet at mean low water can be carried in the improved channel, which is about 1 mile in length. The average rise and fall of the tide is 2.7 feet.

This stream is navigable for small sailboats to farms situated about 9 miles from its mouth.

The commerce in the main consists of manufactured lumber, ore, and farm products, and has increased since improvement. For the calendar year 1911 it is reported to have amounted to 1,771,576 short tons, value not known.

It has not been found possible to ascertain what effect, if any, the improvement has had upon freight rates.

July 1, 1911, balance unexpended	$5,000.00
July 1, 1912, balance unexpended	5,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

(See Appendix L 3.)

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[1] Exclusive of the balance unexpended July 1, 1912.

4. Nansemond River, Va.—This stream rises in Nansemond County, Va., flows in a northerly direction, and empties into Hampton Roads just opposite Newport News, Va. Its length from Suffolk, Va., the head of navigation, to its mouth, is 18 miles.

The original channel of this stream permitted it to be navigated at mean low water by vessels drawing not more than 5 feet. The depth was increased to 8 feet at the same stage of tide, under appropriations made between 1873 and 1878, at a cost of $37,000.

The project under which the work has been carried on was adopted August 11, 1888, and called for a channel 100 feet wide from Suffolk, the head of navigation, to the Western Branch, a distance of about 7 miles, while from the latter place to Town Point, a distance of about 8 miles, its width was to vary from 200 to 400 feet. The depth to be obtained throughout was 12 feet at mean low water. This improvement was estimated to cost $152,000.

At present there has been provided a channel only 80 feet wide and 12 feet deep at mean low water between Suffolk and the mouth, a distance of 18 miles, which is now deemed ample for the commerce of the stream.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
From Suffolk to the mouth					1872 [2]	723
Suffolk to Town Point					1887 [2]	1001
Hampton Roads to Suffolk	House	[1] 395	Sixty-first	Second		
Do	House committee.	[1] 52	do	Third		

[1] No maps.

[2] Contains maps.

The expenditures incurred during the fiscal year were applied to maintenance, which consisted in removing obstructing trees from the channel and banks of the river and amounted to $672.85.

Up to June 30, 1912, the expenditures under the project of 1888 and its modification have amounted to $40,677.11, and $14,969.45 has been applied to maintenance. The channel between Suffolk and the Western Branch has been dredged to 80 feet in width and 12 feet in depth at mean low water, and a turning basin has been excavated at the former place.

At the close of the fiscal year a boat drawing 11 feet at mean low water could reach Suffolk, the head of navigation, 18 miles above the mouth of the river. The tidal variations are about 3 feet at Town Point, 3 miles from the mouth, and 3.8 feet at Suffolk, 18 miles above the mouth.

The commerce of the stream consists principally of lumber, agricultural products, clay, brick, coal, and merchandise. In 1890 it is reported to have reached about 220,000 short tons. For the calendar year 1911 it is reported to have amounted to 78,041 short tons, value not known.

It has not been found possible to ascertain what effect, if any, the improvement has had upon freight rates.

The balance unexpended will be applied toward maintaining the improvement.

July 1, 1911. balance unexpended	$8,026.29
June 30, 1912. amount expended during fiscal year, for maintenance of improvement	672.85
July 1, 1912, balance unexpended	7,353.44

(See Appendix L 4.)

5. *James River, Va.*—The original condition of the James, before its improvement by the General Government was begun in 1870, was as follows:

The ruling depth to the lower city line of Richmond was 7 feet at mean low water. This depth obtained on Rocketts Reef, immediately below Richmond, and on Richmond Bar, 2 miles below. Some 15 miles lower down, in Trents Reach, was a shoal on which there was a depth of only 8 feet. This, however, ceased to be an obstruction in January, 1872, when the 5-mile reach in which it was situated was cut off by the opening of Dutch Gap Canal.

In addition to the above natural obstructions there were, in the 10 miles of river below Richmond, wrecks in the channel at Chaffins Bluff and Graveyard Reach, and obstructions placed during the Civil War at Warwick Bar and Drewry Bluff, consisting at each locality of a military bridge, lines of stone cribs, and sunken vessels. In addition to all these obstructions, the channel between Richmond and Trents Reach was in many places narrow and tortuous.

Between Trents Reach and City Point, a distance of 18½ miles, the ruling depth was 13 feet, which obtained near Varina or Aikens Landing. Between City Point and the mouth of James River the ruling depth was 15 feet, existing at Harrisons Bar and Goose Hill flats, then 43 and 76 miles, respectively, below Richmond.

The source of the river is in the Alleghany Mountains, in Highland County, Va., near the West Virginia State line. Its mouth is at the southern end of Hampton Roads, near Newport News, Va. The length of the river from the confluence of the Cowpasture and Jackson Rivers, by which it is formed, to its mouth, is about 320 miles. Its general direction of flow is easterly. The length of the section included in the project is 103.8 miles. The proposed improvement extends to the mouth of the river.

It was contemplated in the original project, adopted in 1870, to secure a channel having a depth of 18 feet at high tide and a width of 180 feet. The amount expended prior to the adoption of the present project was $763,000, which includes $23,000 appropriated in 1836 and 1852.

The project under which the improvement is now being carried on was adopted July 5, 1884, and is printed in Senate Document No. 147, Forty-seventh Congress, first session (without map). It provides for the formation by means of regulation works and excavation of a channel between the mouth of the river and the lower city line of Richmond, having a depth of 22 feet at mean low tide and a width from the mouth to City Point of 400 feet, thence to Drewry Bluff of 300 feet, and thence to Richmond of 200 feet, at a total estimated cost of $4,500,000.

The act of June 13, 1902, provided for extending the improvement from the lower city line of Richmond to the head of navigation at the docks, in accordance with plan printed in House Document No. 234, Fifty-sixth Congress, first session (with map), at an additional cost of $724,943.15.

The work proposed under this extension consists of excavating a channel about 3,300 feet long and 200 feet wide, with a depth of 22 feet at mean low water.

By act of March 3, 1905, the original project was further extended to include the excavation of a turning basin at Richmond, by increasing the width of the proposed improved channel to 400 feet for a length of 600 feet, the depth to be 22 feet, at a cost not to exceed $150,000.

Reports on examinations and surveys of James River, Va., will be found in Senate Document No. 1, Thirty-third Congress, first session, part 2, 1853, page 389; in the Annual Report of the Chief of Engineers for 1875, page 74; in the report of 1878, page 459; in the report of 1882, page 870; in the report of 1887, page 871; in the report of 1890, page 996; in the report of 1896, page 1010; in the report of 1900, page 1754; in Senate Document No. 147, Forty-seventh Congress, first session; and in House Document No. 234, Fifty-sixth Congress, first session.

More extended information concerning the improvement is contained in Annual Reports of the Chief of Engineers of 1871, pages 603 to 605; of 1882, pages 870 to 887; and of 1900, pages 1757 to 1760.

Maps of James River are contained in the Annual Reports of the Chief of Engineers for 1876, 1900, and 1904, and in House Document No. 234, Fifty-sixth Congress, first session.

The existing project, with above modifications, comprises excavating a channel 22 feet deep at mean low water between the mouth of the river at Hampton Roads and the Virginia & Kanawha Canal ship lock at the lower end of the docks, Richmond, Va., of the following widths: From the river's mouth to City Point, 400 feet; from City Point to Drewry Bluff, 300 feet; and from Drewry Bluff to the head of navigation at the docks, 200 feet, except for a distance of 600 feet, beginning about 600 feet below the ship lock, where the channel width is to be 400 feet, to serve as a turning basin. The total estimated cost of the improvement is $5,374,943.15.

The year's operations comprised enlarging the channel on the following shoals: Warwick Reach, Deep Bottom, City Point, Harrisons Bar, Goose Hill Flats, Swans Point, Dancing Point, and Rocklanding, aggregating a length of about 5½ miles, also in extending the regulation works in Kingsland, Varina, and Deep Bottom Reaches, involving the construction of about 4,700 linear feet of timber jetty. All of the above was new work, the expenditure for which amounted to $112,380.34. There was no expenditure for maintenance.

The amount expended on the present project to June 30, 1912, was $2,104,860.95, of which $70,520.93, expended subsequent to March 3, 1899, was for maintenance. This item of maintenance includes the cost of dredging sand and mud deposited in the channel of the river during the execution of the work in excess of the quantity originally estimated, and also repairs to jetties.

Until November 30, 1910, the improvement of the river was confined chiefly to its upper reaches, where the water was shoalest and the channel rocky, and consequently where the greatest benefits to commerce would be obtained. The exceptions to this were the dredging of shoals at Harrisons Bar, Swans Point Shoal, and Goose Hill Flats to a depth of 18 feet.

In 1910 the improvement of the upper reaches being sufficiently advanced to give a channel with a depth of 18 feet and a minimum width of 100 feet, the excavation of channels on the shoals between City Point and the mouth of the river, to give them a depth of 20 feet and the width of 400 feet prescribed in the project, was begun and has been completed for City Point, Dancing Point, Swans Point, and Rocklanding Shoals. A channel on Harrisons Bar 20 feet deep, having widths of 250 to 400 feet, has been completed, and work has been begun on Goose Hill Flats, with a view to forming a channel 400 feet wide by 20 feet deep.

The project is estimated to be about 39.1 per cent completed.

The result of the work of improvement is a channel from Hampton Roads to within about 100 feet of the city wharf at Richmond, having a width of not less than 100 feet and a depth of 18 feet at mean low water, except on Goose Hill Flats, where for a short distance the width is less than 100 feet.

The maximum draft that could be carried at low water on June 30, 1912, between Richmond and the mouth of the river was 17 feet.

The mean tidal range varies for different parts of the river, being approximately as follows: 2½ feet at Fort Monroe, 1.85 feet at Jamestown, 3 feet at City Point, 3½ feet at Dutch Gap, and 4 feet at Richmond.

The channel length of the James River from Hampton Roads to the head of navigation at Richmond, Va., for steamers and other craft, is 103.8 miles. The river is navigable for rafting and logging for about three-fourths mile above the head of navigation for steamers.

The commerce of the river for the calendar year of 1911 amounted to 472,537 short tons, having an estimated value of $27,004,595. Of the above, 285,126 short tons, having an estimated value of $25,095,183, represent the part of the commerce and its value for the port of Richmond, Va.

The above statistics, as compared with those for the calendar year of 1910, show a decrease in the total of James River tonnnage of about 9.8 per cent and an increase in value of about 6 per cent. A comparison of the statistics for the port of Richmond, Va., for the above periods shows an increase in tonnage of about 4.3 per cent and an increase in value of about 9.1 per cent.

The principal articles of commerce comprised general merchandise, logs, lumber, cordwood, railroad ties, brick, coal, coal oil, fertilizer, and fertilizer material.

The work done has been beneficial in reducing the cost of water transportation of lumber, fertilizer material, coal, and other articles carried principally in sailing vessels and barges. In many instances the freight rates on commodities transported by steamers are the same as rail rates. At present the berthing and terminal facilities at Richmond are inadequate even for vessels of a draft that could now navigate the river. The city of Richmond proposes to deepen the part of the channel situated between the improved channel and the site of a public wharf, on which work has been begun.

The appropriation recommended will be applied to maintenance of improvement by dredging, and to enlarging the channel between Richmond, Va., and the mouth of the river by extending regulation works and dredging, for the extension of benefits.

July 1, 1911, balance unexpended	$300,351.89
Reimbursed by the Isthmian Canal Commission	1.96
	300,353.85
June 30, 1912, amount expended during fiscal year, for works of improvement	[1] 112,380.34
July 1, 1912, balance unexpended	187,973.51
July 1, 1912, outstanding liabilities	7,205.59
July 1, 1912, balance available	180,767.92
Amount appropriated by river and harbor act approved July 25, 1912	70,000.00
Amount available for fiscal year ending June 30, 1913	250,767.92
July 1, 1912, amount covered by uncompleted contracts	165,242.84
Amount (estimated) required to be appropriated for completion of existing project	[2] 3,082,631.58
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[2] 75,000.00

(See Appendix L 5.)

6. *Pagan River, Va.*—This stream rises in Isle of Wight County, Va., flows northeast, and empties into the James River. Its navigable length is about 12 miles.

Originally the shoals in this stream limited the draft of vessels to 6½ feet at mean low water. Under a project adopted in 1880 the sum of $10,000 was expended in dredging a channel 60 feet wide and 8 feet deep at mean low water through three shoals between the mouth and Smithfield, Va.

By the expenditure of $10,671.01, authorized in the act of March 3, 1905, a channel 40 feet wide and 10 feet deep at mean low water was made available.

The present project, adopted by the river and harbor act of June 25, 1910, provides for widening the channel at Smithfield and at a bend one-half mile below Smithfield, and for dredging off the points of abrupt bends in the existing channel farther downstream, at a cost of $4,600, with $1,000 annually for maintenance, in accordance with plan printed in House Document No. 397, Sixtieth Congress, first session.

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[1] $44.24 expended for inspection of material for the Isthmian Canal Commission, and for which reimbursement has been requested, not included in the above money statement.

[2] Exclusive of amount available for fiscal year 1913.

No modification of the existing project since its adoption has been made.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to Smithfield					1875 [1]	156
Do	House	[1] 88	Fifty-sixth	Second	1901 [1]	1474
Do	do	[1] 397	Sixtieth	First		

To June 30, 1912, the total amount expended under the existing project was $4,600.

The project has been completed, but work of maintenance will be required.

There is now a navigable channel about 40 feet wide and 10 feet in depth at mean low water from the 10-foot contour in the James River, Va., to Smithfield, Va., a distance of about 9 miles. The head of navigation is about 3 miles above the latter point. The average range of the tide is 2.6 feet.

The commerce is handled by numerous small schooners and sloops and two regular steamers, and consists largely of peanuts and lumber.

The commerce of this stream has averaged about 100,000 short tons a year, but has varied considerably from year to year, according to whether conditions have or have not been favorable to the production of peanuts and oysters. For the calendar year 1911 it is reported to have amounted to 137,739 short tons, value not known.

It has not been found practicable to ascertain what effect, if any, the improvement has had upon freight rates. There is no rail route to points below the head of navigation.

The estimated amount required for expenditure in the fiscal year ending June 30, 1914, will be applied to maintenance of improvement, by dredging.

Amount appropriated by river and harbor act approved July 25, 1912	$1,000
Amount available for fiscal year ending June 30, 1913	1,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2] 1,000

(See Appendix L 6.)

7. *Appomattox River, Va.—(a) General improvement.*—This stream rises in Appomattox County, Va. The general direction of its flow is northeast to its mouth at City Point in the James River. Its total length is about 137 miles, but its navigable length, which has been improved under the present project, is only about 11 miles between Petersburg, Va., and its mouth.

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[1] No maps.

[2] Exclusive of amount available for fiscal year 1913.

The original channel in this river was narrow and tortuous, and numerous shoals prevented vessels drawing more than 6½ feet from navigating it at mean high water.

The original project for this improvement was adopted in 1871 and provided for a channel 60 feet wide at bottom and 12 feet deep at ordinary high water. In 1893 the project was revised to provide a channel from Petersburg to natural deep water at Point of Rocks, 80 feet wide at bottom and 12 feet deep at ordinary high water, by making a cut-off called Puddledock Cut. The total amount expended on the original project, as modified, prior to operations on the existing project, was $530,516.04, of which the sum of $58,596.04 was for maintenance.

The existing project is the original project as modified above, restored and extended by the river and harbor act of June 25, 1910, and the estimated cost was $73,000, with $3,000 annually for maintenance.

No modification of the existing project has been made since its adoption. It covers the attainment and maintenance of a channel 80 feet wide and 12 feet deep at mean high water between Point of Rocks and Petersburg, a distance of about 7½ miles.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Point of Rocks to Petersburg					1870	68
Do	House [1]	952	Sixtieth	First		

[1] Contains maps.

During the fiscal year the amount expended was $6,538.10, which was for improving the channel by dredging at a number of points between Petersburg and Point of Rocks.

To the close of the fiscal year ending June 30, 1912, the total amount expended on the existing project was $15,215.95.

The existing project is considered completed, but expenditures will be required from time to time for maintenance.

In March, 1912, a severe freshet brought down and deposited in the stream, near Petersburg, a considerable amount of material. A contract for dredging where this shoaling had taken place has been made and work thereunder is in progress. On June 30, 1912, except where dredging was thus made necessary, the channel of the river was nowhere less than 12 feet deep at mean high water from its mouth to Petersburg, Va., the head of navigation. The normal tidal range is 2.6 feet.

The commerce consists of fertilizer and miscellaneous products. In 1890 it amounted to about 20,000 short tons. It gradually increased until in 1900 and 1901 it amounted to about 150,000 short tons. Since then it has decreased, and for the calendar year 1911 it is reported to have been 24,430 short tons.

The improvement has undoubtedly resulted in more favorable freight rates to and from Petersburg, Va.

The available balance will be applied to maintenance of the improvement, by dredging, where necessary.

July 1, 1911, balance unexpended	$20,004.41
June 30, 1912, amount expended during fiscal year, for works of improvement	6,538.10
July 1, 1912, balance unexpended	13,466.31
July 1, 1912, outstanding liabilities	1,428.33
July 1, 1912, balance available	12,037.98
July 1, 1912, amount covered by uncompleted contracts	2,550.00

(*b*) *At Petersburg.*—The project for the work contemplated is not to provide a navigable channel, but to excavate a new channel into which to deflect the river, and thus overcome the trouble experienced by the deposit of sediment in the navigable channel of the river in the neighborhood of Petersburg.

The project for this work, which was adopted June 13, 1902, contemplates the excavation to mean low water of a cut from 200 to 300 feet wide and 2½ miles long and the diversion of the river into the said cut by means of a dam built across the present channel at the head of the harbor of Petersburg, and includes the construction of bridges for the highways and railway crossing the new channel and other incidental work.

The estimate of the cost of this work was $266,915, but the act of June 13, 1902, limited the total cost of the work to $200,000. The act of March 3, 1909, authorized its increase to $260,000, and this whole amount has been appropriated.

No modification of the original project, except as to cost, has been made since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
At Petersburg					1882 [1]	908
Petersburg to Point of Rocks					1889 [2]	952
Do					1893 [2]	1333
At Petersburg	House [1]	139	Fifty-sixth	Second		

[1] No maps.

[2] Contains maps.

The expenditures during the fiscal year, amounting to $22,526.10, were applied to payment for work done under contract, which consisted of excavating earth from under new highway bridge, of rock near piers of railroad bridge, of rock other than near piers of railroad bridge, shaping up levee, removal of bulkhead, and extending flume.

At the close of the fiscal year 1912 the sum of $243,414.85 had been expended on the existing project.

The project is about 94 per cent completed; all of the land needed has been acquired, the highway and railway bridges have been built, the new cut excavated, and the dam across the river built to a height of 9.5 feet above diversion low water.

The freshet of March, 1912, broke the incomplete diversion dam and through this break water now flows at low tide. Funds are available for rebuilding the dam, but it has been recommended that this work be not undertaken until the south bank of the stream for a distance of about 2,000 feet above the dam site is raised above the overflow level, or to about 20 feet above low water. The general elevation of this bank at present is about 16 feet above low water, and on it are the tracks of the Norfolk & Western Railroad. Its raising is no part of the present project.

The commerce to be effected by the improvement is the same as that mentioned in the preceding section, and all general statements made therein apply equally well to this section.

The balance of funds will be applied to completing the work under the adopted project and maintaining the works.

July 1, 1911, balance unexpended	$44, 111. 25
June 30, 1912, amount expended during fiscal year, for works of improvement	22, 526. 10
July 1, 1912, balance unexpended	21, 585. 15

(See Appendix L 7.)

8. *Harbor at Cape Charles City, Va.*—The harbor proper is landlocked and covers an area of 10 acres, and it and the exposed channels leading thereto had, before the beginning of the work, a depth of 12 feet at mean low water. It is distant by water 37 miles northeast of Norfolk, Va.

The project was adopted in 1890 and requires the dredging of a channel through Cherrystone Inlet and bar 100 and 200 feet wide, respectively, and 16 feet deep at mean low water, the dredging of an entrance channel 100 feet wide of the same depth, and dredging over the entire area of the protected and inclosed harbor to a depth of 14 feet at mean low water. Jetties of stone were to be constructed for the protection of the channel leading into the basin. This work was estimated to cost $142,340.

No modification of the original project has been made since its adoption.

For more extended information, see Annual Report of the Chief of Engineers for 1890, page 971; no maps.

No work was done and no expenditures were made during the fiscal year.

The expenditures to June 30, 1912, amounted to $119,143.84, of which $13,360.16 was applied to maintenance.

The sum of $250 has been received on account of the annulment of a contract and the extra cost of doing the work.

The project is completed, except the building of the south jetty to the length originally proposed, and this is now thought unnecessary.

The work resulted in the dredging and redredging of the inner harbor to the proper depth, and the excavation of channels of the required dimensions through the inlet and bar and the entrance to the basin, and the construction of 875 feet of the north jetty and 232 feet of the south jetty. The north jetty is 1,625 feet in length, but 750 feet of this was built without expense to the United States.

On June 30, 1912, a vessel drawing 12 feet could enter the harbor at mean low water. The docks within the landlocked harbor are about 3 miles from the 16-foot contour in Chesapeake Bay at Cherrystone bar. The range of the tide is about 2.5 feet.

The commerce consists mainly of miscellaneous freight, agricultural products, fertilizer, and some oysters and fish. At the beginning of the improvement the annual commerce was about 400,000 short tons. For the calendar year 1911 it is reported to have amounted to 2,460,301 short tons, value not known.

It has not been found practicable to ascertain what effect, if any, the improvement has had upon freight rates.

The balance available may be expended for maintenance of improvement if necessary.

July 1, 1911, balance unexpended	$26,106.16
July 1, 1912, balance unexpended	26,106.16

(See Appendix L 8.)

9. Onancock River, Va.—This stream rises in Accomac County, Va., flows west and empties into Chesapeake Bay. Its length to the town of Onancock, Va., the head of navigation, is about 5 miles.

Before improvement the channel depth was 4 feet at mean low water to the head of navigation, and 5 feet at mean low water across the bar at the mouth of the river.

Under projects adopted in 1879 and 1890, a channel 100 feet wide and 7 feet deep at mean low water was dredged through the mud flats near the wharves of Onancock, and channels 300 feet wide and 200 feet wide and 8 feet deep at mean low water were dredged through the outer and inner bars. The expenditures aggregated $20,511. The channel across the outer bar shoaled to 7 feet at mean low water; the inner bar channel has not deteriorated appreciably, but the natural channel in the river proper is narrow and tortuous, and where it was dredged there had been some shoaling.

The present project, adopted by the river and harbor act of June 25, 1910, is to dredge a channel 200 feet wide and 8 feet deep at mean low water across the outer bar, a distance of about 1,000 feet, and to straighten the river channel by cutting off projecting shoals to a depth of 7 feet at mean low water, at an estimated cost of $13,500, with annual maintenance of $1,000 after completion.

No modification of the existing project, since its adoption, has been made.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual report of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to Onancock					1879 [1]	510 716
Do	House	68	Forty-fifth	Third		
Do	do	83	Fifty-first	First		
Do	do	[1] 652	Sixtieth	do		

No work was done and no expenditures were made during the fiscal year.

The expenditures under existing project to June 30, 1912, amounted to $13,038.02.

The project has been completed.

On June 30, 1912, vessels of 7 feet draft could reach Onancock, Va., at mean low water. The rise and fall of the tide is about 2 feet.

For the calendar year 1892 the commerce was reported at 44,009 short tons, valued at $1,405,460. For the calendar year 1911 it is reported at 48,057 short tons, valued at $2,960,924.

It has not been found practicable to ascertain what effect, if any, the improvement has had upon freight rates.

The balance unexpended and the additional appropriation recommended will be applied toward maintaining the improvement.

July 1, 1911, balance unexpended	$461.98
July 1, 1912, balance unexpended	461.98
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2] 1,000.00

(See Appendix L 9.)

10. Waterway from Norfolk, Va., to the sounds of North Carolina.—This waterway extends from Norfolk, Va., via the Southern Branch of Elizabeth River to Deep Creek, thence through the Dismal Swamp Canal to South Mills, N. C., and from the latter point through Turners Cut to Pasquotank River, to Albemarle Sound, a distance of 67 miles, and thence to Pamlico Sound by Croatan Sound.

The draft which could be carried through this waterway at the time of the adoption of the project for improvement was limited to 2½ feet at mean low water, owing to the deterioration of the Dismal Swamp Canal, which originally had a depth of about 6 feet.

The project adopted March 3, 1899, provides for dredging channels in Deep Creek, 3 miles long, Turners Cut, 3.8 miles long, through a shoal in Pasquotank River near Ship Yard Bar, 1,800 feet long, and through a bar in Croatan Sound near Croatan Light, 1,200 feet long. All these channels, except the last named, were to be 100 feet wide and 10 feet deep at mean low water. The Croatan Channel was to be 200 feet wide and 12 feet deep at mean low water. For the protection of these channels sheet piling was to be driven where necessary. The estimated cost of this work was $274,310.

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[1] No maps.

[2] Exclusive of the balance unexpended July 1, 1912.

No modification of the original project has been made since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Pasquotank River					1876 [1]	360
General					1880 [1]	851
Pasquotank River					1885 [1]	1049
Do					1889 [1]	1135
Deep Creek	House [1]	154	Fifty-third	Third	1896 [1]	1298
Turners Cut	do. [1]	218	do	do	1896 [1]	1357
General	do. [1]	317	Fifty-fourth	First	1896 [1]	1086
Deep Creek	do. [1]	131	Fifty-fifth	Third	1899 [1]	1485
South Mills to and including Ocracoke and Beaufort Inlets.	do. [2]	202	Fifty-sixth	Second	1901 [1]	1511
Norfolk, Va., to Beaufort Inlet, N. C.	do. [2]	563	Fifty-eighth	do	1904 [1]	1387
General	do. [2]	391	Sixty-second	do		

[1] No maps.

[2] Contains maps.

The expenditures during the fiscal year were for repair and care of United States plant, and amounted to $560.39.

Up to June 30, 1912, the sum of $262,987.66 had been expended on the project, of which $11,791.20 was for maintenance.

The project has been completed, but additional work is required for maintenance.

On June 30, 1912, vessels drawing 10 feet of water can at mean low water navigate through all sections of the route which have been improved by the United States. The canal, which extends from Deep Creek to South Mills, is maintained at the expense of a private corporation, which tries to keep it available for vessels of 10 feet draft, but on June 30, 1912, the limiting depth for the entire route was only 9 feet, owing to the existence of shoal places in the canal. Deep Creek is the only tidal portion of the improvement, and there the rise and fall averages 3 feet. In the other sections the water level changes according to the direction and velocity of the wind.

The commerce for the calendar year 1911 is reported to have amounted to 574,008 short tons; value not known. The main items of commerce are coal, fertilizer, farm products, and general merchandise.

It has not been found practicable to ascertain what effect, if any, the improvement has had upon freight rates.

The available funds will be applied toward removal of obstructions and toward dredging for the purpose of maintaining the improvement.

July 1, 1911, balance unexpended	$5,442.73
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	560.39
July 1, 1912, balance unexpended	4,882.34

(See Appendix L 10.)

11. Inland water route from Norfolk Harbor, Va., to Albemarle Sound, N. C., through Currituck Sound.—This route extends from Norfolk, Va., to Albemarle Sound via the Southern Branch of the Elizabeth River, 11 miles long; Albemarle and Chesapeake Canal, 9 miles long; North Landing River, 17 miles long; Currituck Sound, 10½ miles long; Coanjock Bay, 2¾ miles long; North Carolina Cut, 2⅘ miles long; and North River, 13½ miles long. The canal and cut mentioned are now controlled by a private corporation.

This route had originally a good 5-foot mean low-water channel, but navigation was obstructed by snags, sunken logs, and overhanging trees. Sharp bends added to the other difficulties of navigation.

Until the act of September 19, 1890, the work of improvement was carried on under several separate projects, upon which a total of $240,169.69 had been expended. By that act all these projects were consolidated.

The present project, adopted September 19, 1890, provides for obtaining a channel 80 feet wide and 9 feet deep at mean low water through the whole extent of the waterway to be improved by the United States, at an estimated cost of $306,667.08, including the previous expenditures above mentioned.

The river and harbor act of July 25, 1912, made provision for the purchase of the Chesapeake and Albemarle Canal, and for deepening the waterway between Norfolk, Va., and Beaufort Inlet, N. C., to 12 feet at mean low water, and report on the new project will be found at page 415 of this report.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
North Landing River					1879 [1]	686
Norfolk Harbor to the Atlantic Ocean, south of Hatteras, and communication with Cape Fear River.					1880 [2]	851
Currituck Sound, Coanjock Bay, and North River Bar.					1889 [2]	961
Norfolk to Beaufort, N. C	House	[1] 563	Fifty-eighth	Second		
Preliminary examination and survey for waterway from Norfolk, Va., to Beaufort, N. C.					1904 [1]	1387
Norfolk to Beaufort Inlet, N. C	House	[2] 84	Fifty-ninth	Second		

[1] No maps. [2] Contains maps.

The expendtures during the fiscal year were applied to maintenance, which consisted in keeping the waterway clear of sunken obstructions, repair and care of United States plant, and amounted to $1,541.23.

Since September 19, 1890, and up to June 30, 1912, the sum of $100,490.04 had been expended upon improvement, of which the sum of $38,502.04 was for maintenance.

The sum of $2,417.19 has been received from sales.

The project is considered completed, but additional work will be required for maintenance.

The draft of vessels which can pass through the route at mean low water on June 30, 1912, is 9 feet. The route is about 67 miles long.

There is no lunar tide in any portion of the route, except in the Southern Branch of the Elizabeth River, where the average rise and fall is 2.7 feet. In the other sections the water level varies according to the velocity and direction of the wind, for which an allowance of 0.5 foot is made, but severe storms may cause an elevation or depression of 2 feet or more.

The commerce has varied considerably since the route was opened to navigation. The highest reported was for the calendar year 1890, when it amounted to 403,111 short tons. Since that time it has decreased considerably, and for the calendar year 1911 it amounted to 100,439 short tons, value not known. The prncipal items of shipment consist of coal, fertilizer, produce, timber products, and general merchandise.

It has not been found possible to ascertain what effect, if any, the improvement has had upon freight rates.

July 1, 1911, balance unexpended	$5,198.69
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,541.23
July 1, 1912, balance unexpended	3,657.46
July 1, 1912, outstanding liabilities	448.67
July 1, 1912, balance available	3,208.79
Amount appropriated by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	6,208.79

(See Appendix L 11.)

12. Inland waterway from Norfolk, Va., to Beaufort Inlet, N. C.—This waterway is to be a part of the Boston (Mass.) to Beaufort Inlet (N. C.) section of the proposed continuous inland waterway from Boston, Mass., to the Rio Grande, and covers that portion of the route lying between Norfolk, Va., and Beaufort Inlet, N. C., a distance of 186 miles.

The approved project adopted in the river and harbor act of July 25, 1912, provides for a waterway 12 feet in depth at mean low water, at an estimated cost of $5,400,000, as described in House Document No. 391, with maps, Sixty-second Congress, second session.

References to examinaton or survey reports and maps or plans not in project document described above, but having a bearing on this project, will be found under inland water route from Norfolk Harbor, Va., to Albemarle Sound, N. C., through Currituck Sound.

Between Norfolk, Va., and Albemarle Sound, the proposed route follows successively the Southern Branch of the Elizabeth River, Va., the Virginia Cut of the Albermarle and Chesapeake Canal, North Landing River, Currituck Sound, Coanjock Bay, the Carolina Cut of the Albemarle and Chesapeake Canal, and North River to Albemarle Sound, a distance of 63.5 miles.

Between Albemarle and Pamlico Sounds the proposed route follows successively the Alligator River, a proposed cut across land to Rose Bay, N. C., and Rose Bay, N. C., to Pamlico Sound, a distance of

52.7 miles. (Between Albemarle and Pamlico Sounds there exists at present a navigable waterway through Croatan Sound, having a depth of about 9 feet.)

Between Pamlico Sound and Beaufort Inlet, N. C., the proposed route follows the existing waterway via Neuse River, Adams Creek, Adams Creek Canal, Core Creek, and Newport River to Beaufort, N. C., a distance of 38 miles.

The river and harbor act of July 25, 1912, appropriated $600,000 for this project, of which $500,000 is for the purchase of the canal and appurtenant property owned by the Chesapeake & Albemarle Canal Co.

During the fiscal year ending June 30, 1913, it is proposed to execute the necessary surveys, purchase the above canal, and acquire as much of the land needed for right of way in other parts of the waterway as the funds will permit.

The $800,000 recommended for appropriation during the fiscal year ending June 30, 1904, will be applied to the completion of the purchase of right of way, the purchase of a dredge, excavation by contract, and the reconstruction of bridges.

Amount appropriated by river and harbor act approved July 25, 1912	$600,000
Amount available for fiscal year 1913	600,000
Amount (estimated) required to be appropriated for completion of existing project	[1] 4,800,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 800,000

(See Appendix L 12.)

13. Blackwater River, Va.—This stream rises in Prince George County, near Petersburg, Va., flows first southeast, then south to its junction with Nottaway River, where the two form the Chowan River. Its total length is about 80 miles, but work under the existing project is confined to the section 13 miles long just above its mouth.

In its original condition the navigable channel had a depth of about 7 feet, but navigation was difficult, owing to the existence of obstructions and sharp bends.

Between 1878 and 1882 Congress appropriated a total of $14,000 for the improvement of the stream, to consist of the removal of logs, snags, overhanging trees, and the removal of sharp bends. Operations ceased in 1884, from which time no work was done upon the river to 1908.

The existing project was adopted March 2, 1907, and provides for the clearing of the stream of the existing obstructions so as to afford a condition of easy navigation. The estimated cost of the project is $8,000, all of which has been appropriated.

No modification of the existing project, since its adoption, has been made.

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[1] Exclusive of amount available for fiscal year 1913.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Franklin to mouth					1875 [1]	161
Do	House	[1] 177	Fifty-ninth	First		

[1] No maps.

No work was done and no expenditures were made during the fiscal year.

To June 30, 1912, there had been expended $3,544.11 on the existing project, of which $1,399.78 was for maintenance.

The sum of $15 has been received from sales.

The project is considered as completed, but additional work will be required for maintenance.

On June 30, 1912, vessels drawing 7 feet can navigate the river at ordinary low stages. The river is a tideless stream, and the only fluctuations in the water level are those due to freshets, which usually do not exceed 3 to 4 feet. The head of navigation is at Franklin, Va., 13 miles from the mouth.

During the calendar year 1909 the commerce amounted to 5,413 short tons, valued at $862,400, and for 1911 it is reported at 4,126 short tons, valued at 363,937. The principal items consisted of agricultural products, fertilizer, and general merchandise.

It is impracticable to state what effect, if any, the improvement has had on freight rates.

The available balance will be expended in maintaining the improvement as may be found necessary from time to time.

July 1, 1911, balance unexpended	$4,470.89
July 1, 1912, balance unexpended	4,470.89

(See Appendix L 13.)

14. Meherrin River, N. C.—This stream rises in Greenville County, Va., flows in a general easterly direction and empties into the Chowan River, N. C. Its total length is about 50 miles, but work under the existing project is confined to the section 11 miles long just above its mouth.

In its original condition, the navigable channel was about 80 feet wide and 7 feet deep, but was tortuous, badly obstructed by logs, overhanging trees and a few shoals.

In the year 1882 Congress appropriated $5,000 toward the improvement of the river, the improvement to consist in the removal of the obstructions to navigation, and operations were carried on from time to time in the years 1883 to 1886, inclusive. The total expenditure amounted to $4,584.53.

The existing project was adopted by Congress March 2, 1907. It provides for the removal of existing obstructions, sunken logs, overhanging trees, and a few shoals, so as to render navigation easy.

The estimated cost of the project is $6,000, all of which has been appropriated.

No modification of the existing project, since its adoption, has been made.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Skinner's bridge to mouth					1882 [1]	1114
Mouth to Murfeesboro	House	[1] 137	Fifty-ninth	First		

[1] No maps.

No work was done and no expenditures were made during the fiscal year.

To June 30, 1912, there had been expended on the existing project $3,682.07, of which the sum of $1,749.19 was for maintenance.

The sum of $10 has been received from sales.

The project is considered completed, but additional work will be required for maintenance.

On June 30, 1912, the maximum draft that could be carried with safety was 7 feet at ordinary low stages. The river is a tideless stream, but freshets cause variations in the water lever of 3 to 4 feet. The head of navigation is at Murfreesboro, 11 miles above the mouth of the river.

During the calendar year 1908 the commerce of the river aggregated 8,690 short tons, valued at $1,086,700, and for 1911 it is reported at 14,111 short tons, value not known. The principal items of shipment are timber, fertilizer, farm products, and general merchandise.

It is impracticable to state what effect, if any, the improvement has had on freight rates.

It is proposed to expend the available balance in maintaining the improvement as may be found necessary from time to time.

July 1, 1911, balance unexpended	$2,327.93
July 1, 1912, balance unexpended	2,327.93

(See Appendix L 14.)

15. Roanoke River, N. C.—This stream is formed by the junction of the Dan and Staunton Rivers in Mecklenburg County, Va., flows in a general southeasterly direction, and empties into Albemarle Sound, N. C. Its total length is about 200 miles, but work under the existing project has been confined to the 129 miles from Weldon, N. C., to the mouth.

Originally the navigable channel to Indian Highland bar, 67 miles above the mouth, was 10 feet deep at mean low water, and thence to the town of Weldon, which is 129 miles from the mouth, the minimum depth was 2½ feet at the same stage.

The project, adopted in 1871, contemplates a channel with a least width of 50 feet from Hamilton to Weldon, 5 feet deep at mean low water, and the removal in the lower portion of the river, below the former point, of such obstructions as may be necessary to accommodate vessels navigating North Carolina sounds. The estimated cost of the work was $269,000.

No modification of the original project, since its adoption, has been made.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Weldon to mouth					1872 [1]	726
Weldon to Clarksville, Va					1882 [1]	1060
Weldon to Plymouth					1884 [1]	1020
Highland Landing to mouth					1888 [2]	840
Clarksville to Eaton Falls					1890 [1]	1175
Albemarle Sound to Weldon					1890 [2]	1106
Do					1892 [2]	Atlas 18

[1] No maps.

[2] Contains maps.

The expenditures during the fiscal year were for repair and care of United States plant, and amounted to $548.70.

The expenditures to June 30, 1912, amounted to $242,900.69, of which amount $14,465.07 has been expended in maintenance. There has been received from sales $1,361.50.

The project is about 80 per cent completed.

The channel obstructions have been removed, and a channel depth of 4 feet at mean low water over the projected width has been provided between Hamilton and Weldon, a distance of 67 miles. On June 30, 1912, vessels drawing 8½ feet could go as far as Hamilton, 62 miles from the mouth; and beyond that point, to within a short distance of Weldon, 4 feet could be carried at mean low water. A bar is forming at the mouth of the river, due to deposits brought down by freshets, and this has somewhat diminished the depth that could otherwise be carried to Hamilton. The upper river is subject to heavy freshets, which cause the only variation in the level of the water surface. Weldon, situated about 129 miles from the mouth, is the head of navigation.

The commerce has varied considerably since the improvement was undertaken, the maximum amount of freight transported having been in 1891, when it was 376,181 short tons. Since then it has decreased, and for the calendar year 1911 it is reported at 54,839 short tons, value not known. The principal items of shipment are timber, fertilizer, and farm products.

The depletion of the forests and the development of railroads in the territory tributary to the river have served to reduce the volume of water-borne freight in recent years.

It has not been found possible to ascertain what effect, if any, the improvement has had upon freight rates.

The balance available will be applied in maintaining the improvement by keeping the channel clear of logs, snags, and similar obstructions.

July 1, 1911, balance unexpended	$5,009.51
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	548.70
July 1, 1912, balance unexpended	4,460.81

(See Appendix L 15.)

16. Removing sunken vessels or craft obstructing or endangering navigation.—(*a*) *Wreck of tug "Col. J. C. Hill" in James River, Va.*—Notice of the wreck being abandoned by its owner, Jens Petersen, of Berkley, Va., was received June 16, 1911. The wreck was reported as lying about 1 mile southerly of White Shoal Light House, in James River, Va. An examination was made of the wreck September 12, 1911, which showed that it was an obstruction to navigation. It was removed November 10–11, 1911.

(*b*) *Wreck of sunken barge at the mouth of Wards Creek, James River, Va.*—Complaint of this wreck being an obstruction to navigation was made June 22, 1911. This wreck was reported as lying at the mouth of Wards Creek, in James River, Va. An examination of the wreck was made September 11, 1911, when it was found to be an obstruction. It was removed November 6–8, 1911.

(*c*) *Wreck of schooner "Stella B. Kaplan."*—This wreck was reported in September, 1911, as lying on the tail of the horseshoe in lower Chesapeake Bay, Va. The wreck was removed during the month of December, 1911.

(*d*) *Wreck of schooner "Joel F. Sheppard."*—This wreck was reported in November, 1911, as lying in Pungoteague Creek, near Harborton, Va. At the close of the fiscal year the work of removal had not been completed.

(*e*) *Wrecks (names unknown).*—These five wrecks were reported in December, 1911, as lying in Hampton Creek, Va. The wrecks were removed during the month of May, 1912.

(*f*) *Wreck of schooner "Joseph G. Ray."*—This wreck was reported in January, 1912, as lying about 5 miles south by west from Smith's Island, Va. The wreck was destroyed by the revenue cutter *Onondaga* at a cost reported to be $1,124.89.

The cost of the work on the wrecks removed by the Engineer Department during the fiscal year was $5,774.18.

(See Appendix L 16.)

EXAMINATIONS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Reports on preliminary examinations required by the river and harbor act approved February 27, 1911, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated.

1. Preliminary examination of harbor at Newport News, Va., and waters near, in, and about the city of Newport News, with a view to *securing increased anchorage area for small craft.*—Report dated June 10, 1911, is printed in House Document No. 456, Sixty-second Congress, second session. The improvement of this locality in the manner apparently desired is not deemed worthy of being undertaken by the United States at the present time.

2. Preliminary examination, with plan and estimate of cost of improvement, of the Western Branch of Elizabeth River, Va.—Reports dated June 10, 1911, and August 26, 1911, with map, are printed in House Document No. 566, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $82,000 for first construction, with $2,000 annually for maintenance, is presented.

The local officer was also charged with the duty of making other preliminary examinations and surveys required by the river and harbor acts approved June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. *Edenton Bay, N. C.*
2. *Pagan River, Va.*, with a view to securing a depth of 12 feet, and a turning basin at Smithfield.
3. *Cape Charles City Harbor, Va.*, with a view to straightening the north side of channel at the entrance and increasing the width of the channel to 200 feet.
4. *Chowan River, N. C.*
5. *Conoby Creek, N. C.*

IMPROVEMENT OF RIVERS AND HARBORS IN THE WILMINGTON, N. C., DISTRICT.

This district was in the charge of Capt. Earl I. Brown, Corps of Engineers, from July 1 to July 8, 1911; in the temporary charge of Capt. L. H. Rand, Corps of Engineers, from July 8 to December 11, 1911; and in the charge of Maj. H. W. Stickle, Corps of Engineers, since December 11, 1911. Division engineer, Col. Dan C. Kingman, Corps of Engineers.

1. Scuppernong River, N. C.—The river rises in the center of a peninsula between Albemarle Sound on the north and Pamlico Sound on the south. It is about 30 miles long and flows in a general northerly direction, making a long bend eastward to the town of Columbia, then turning westward again until it flows into Albemarle Sound. Section under improvement, from mouth to Spruills Bridge, 23 miles. From the mouth to Columbia is 5 miles; to Cherry, 26 miles.

Before work was commenced on the river there was only about 5 feet at mean low water across the bar at its mouth. The upper portion was obstructed by logs, snags, stumps, overhanging growth, and abrupt bends, permitting navigation by small vessels only.

The original project, adopted in 1879, was to dredge the bar so as to obtain a channel 80 feet wide and 9 feet deep at low water, and to make cut-offs at sharp bends and to remove obstructions up to Spruills Bridge. The sum of $8,000 was expended on the original project.

The present project, adopted by the act of June 13, 1902 (printed in H. Doc. No. 131, 56th Cong., 2d sess., and published on pp. 1541-1543, Annual Report of Chief of Engineers, 1901, without maps), provides for dredging a channel 3,400 feet long, 150 feet wide, and 9 feet deep at mean low water across the bar at the mouth of the river, at a cost of $14,000.

No modification of the existing project has been made since its adoption.

No work was done during the year. The expenditures were $142.36, all for maintenance, and were for collecting commercial statistics, and office expenses.

Expended up to June 30, 1912:	
For improvement	$13,248.68
For maintenance	6,643.68
Total	19,892.36
Received from rents	250.00

The project has been completed, but some shoaling has occurred. At the close of the fiscal year 1912, the conditions are a channel 6.6 feet deep at mean low water and 150 feet wide across the bar at the mouth of river, thence to Cross Landing, 14 miles above, a good open channel of 7 feet at mean low water free from obstacles; thence to Spruills Bridge, 9 miles farther, 7 feet at mean low water, but the river in many places is narrow and crooked and obstructed by overhanging trees on the banks and by logs and snags in the channel.

This is a nontidal stream with no slope, the oscillations of the surface being controlled by the winds, which cause a maximum ordinary variation of 1 foot.

Cherry, 26 miles from its mouth, is the head of navigation, to which point 5 feet can be carried at mean low water. Above Cherry, the landowners have constructed drainage canals, which are virtually an extension of the river, through which some logging and rafting may be carried.

The commerce for 1911 amounted to 37,658 short tons, valued at approximately $349,092, an increase of 8,464 short tons over last year's tonnage.

This commerce consisted principally of lumber, timber, fertilizers, and general merchandise.

The improvement has had the effect of reducing freight rates to Columbia and other points on the stream.

It is proposed to apply the available funds to maintenance by dredging on the bar at the mouth of river, necessary repairs to plant, superintendence, and surveys.

July 1, 1911, balance unexpended	$2,500.00
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	142.36
July 1, 1912, balance unexpended	2,357.64
July 1, 1912, outstanding liabilities	50.00
July 1, 1912, balance available	2,307.64
Amount appropriated by river and harbor act approved July 25, 1912	2,000.00
Amount available for fiscal year ending June 30, 1913	4,307.64

(See Appendix M 1.)

2. *Shallowbag Bay, N. C.*—Situated on northeastern side of Roanoke Island, N. C. Before improvement began, about 5 feet was the maximum draft that could be carried into the bay at mean low

water. A bar existed at the entrance over which the depth was 5 feet. Inside the bay was a pocket whose average depth was a little more than 7 feet. From the entrance out into Roanoke Sound the depth increased to 8½ and 9 feet. The town of Manteo is at the head of the bay, on Doughs Creek, about 1 mile from the entrance. Elizabeth City, N. C., the nearest town of any importance, is 45 miles to the north, and Washington, N. C., lies 115 miles to the south.

The present and only project for improvement, adopted by the river and harbor act approved June 25, 1910, provided for securing a channel by dredging, 100 feet wide and 6 feet deep, from the entrance of the bay to the wharves at Manteo, at an estimated cost of $13,750, with $2,000 annually for maintenance after completion, in accordance with the plan printed in House Document No. 906, Sixtieth Congress, first session. (Contains map.)

The expenditures for the year were $9,777.64, all for improvement. The work consisted of dredging under contract 34,413.7 cubic yards of material.

Amount expended on project up to June 30, 1912, for improvement, $10,503.18.

At the close of the fiscal year 1912, the project was completed, and so far as known no deterioration in the dredged channels had occurred.

Six feet at mean low water is the maximum draft that can be carried from Roanoke Sound to the town of Manteo. Length of dredged channel 0.9 mile.

The bay is nontidal. Variations in water level due to winds seldom exceed 1 or 2 feet higher or lower than the mean stage.

The commerce for the year amounted to 13,194 short tons, valued at $680,209, an increase of 2,681 tons over last year.

The tendency of the improvement is to reduce freight rates.

The balance of funds available will be applied to maintenance of the improvement.

July 1, 1911, balance unexpended	$13,024.46
June 30, 1912, amount expended during fiscal year, for works of improvement	9,777.64
July 1, 1912, balance unexpended	3,246.82
Amount appropriated by river and harbor act approved July 25, 1912	1,000.00
Amount available for fiscal year ending June 30, 1913	4,246.82

(See Appendix M 2.)

3. *Fishing Creek.*—This stream rises in Warren County, N. C., and flows in a general southeasterly direction, forming for some distance the boundary line between Warren and Halifax Counties on the north and Franklin, Nash, and Edgecombe Counties on the south. It empties into Tar River about 8 miles above Tarboro. Its total length is about 120 miles (about 50 miles in an air line). Section under improvement, mouth to railroad bridge, 40 miles above.

When improvement began the stream was badly obstructed by masses of fallen timber, overhanging trees on banks, logs and snags in channel, and was navigable by rafts only a few miles above the mouth. Its depth was about 4 feet at ordinary stages to Bellamy's mill, and its width from 40 to 100 feet, and occasionally 120 feet.

The original project of 1889 (see H. Ex. Doc. No. 32, 51st Cong., 1st sess., pp. 1179–1181, Annual Report of Chief of Engineers, 1890, no map) was to clear the stream of logs, snags, trees, etc., up to Bellamy's mill, about 50 miles above its mouth, so as to give a minimum low-water depth of 20 inches and a minimum width of 40 feet. It was amended in 1896 to limit the work to that part below the Wilmington & Weldon Railroad bridge, about 40 miles above the mouth, and this amended project was completed in 1901, since which time work has been confined to maintenance below Beech Swamp, 18 miles above the mouth.

The sum of $22,715.10 was spent on this project, which has been finished.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to Bellamy's mill	House	[1] 32	Fifty-first	First	1890 [1]	1179–1181
Do					1896 [2]	1377

[1] No maps. [2] Contains maps.

The expenditures for the year were $485.81, all for maintenance. The work consisted of snagging operations by Government plant and hired labor, which resulted in clearing the channel between the mouth and Beech Swamp.

Amount expended up to June 30, 1912, for maintenance, $3,969.81.

The stream is not navigable above Beech Swamp on account of its tortuous course and rapid current. Below that point it is navigable during the higher stages about five months annually.

Between Beech Swamp and the railroad bridge the condition of the stream is unknown, but it is presumably bad.

The present head of navigation is Beech Swamp, 18 miles from its mouth, to which about 2 feet can be carried during about five months of the year, and the stream is now in fair condition to that point.

The water surface varies from a minimum depth of 6 inches at low water to 10 feet during the high freshet stages.

The commerce for 1911 amounted to 1,729 short tons, valued at $12,205, showing an increase over that for 1910 of 1,489 tons. It consisted principally of cotton seed, cottonseed meal, fertilizers, timber, etc.

The effect of the improvement on railroad and boat rates can not be definitely stated, but the stream when open to navigation affords an outlet to farm products, timber, lumber, etc., which have no other outlet except by wagons.

It is proposed to apply the additional appropriation recommended to maintenance of the natural channel by snagging.

July 1, 1911, balance unexpended	$550.90
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	485.81
July 1, 1912, balance unexpended	65.09
Amount appropriated by river and harbor act approved July 25, 1912	1,500.00
Amount available for fiscal year ending June 30, 1913	1,565.09
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]1,500.00

(See Appendix M 3.)

4. *Waterway connecting Swan Quarter Bay with Deep Bay, N. C.*—Situated on the north side of Pamlico Sound, near the mouth of Pamlico River. Swan Quarter, the county seat of Hyde County, is situated at the head of Swan Quarter Bay. The nearest large cities to Swan Quarter are Washington, N. C., 50 miles distant in a northwesterly direction on the Pamlico River and Belhaven, 30 miles distant in a northwesterly direction on the Pungo River.

Prior to the improvement of the waterway by the United States, a channel existed ranging in width from 25 to 150 feet, 2 to 7 feet deep at mean low water and 0.6 mile long.

The present and only project for improvement, adopted by the river and harbor act approved June 25, 1910, contemplated securing a channel by dredging 5,500 feet long, 50 feet wide at the bottom, and 6 feet deep at mean low water, at an estimated cost of $14,575, with $900 annually for maintenance, in accordance with plan printed in House document No. 445, Sixtieth Congress, first session. (No map.)

No work was done during the year. The expenditures, $792.15, all for improvement, were for liabilities outstanding July 1, 1911, and main office expenses.

The total amount expended on the project up to June 30, 1912, is $8,550.98, all for improvement.

The project has been completed. There was no deterioration in the project width and depth at the end of the fiscal year, and 6 feet is the maximum draft that can be carried through the waterway at mean low water. Since the completion of the waterway, the distances by water from Swan Quarter to Washington, to Belhaven, and other points on Pamlico and Pungo Rivers have been shortened about 5 miles.

Lunar tides are very small, the variations in water level being due to winds, the maximum variation not exceeding 2 feet.

The commerce for 1911 amounted to 3,752 tons, valued at $266,655, an increase of 1,233 tons over last year. The latter statistics were for commerce to and from Swan Quarter and points on Pamlico River.

The effect of the improvement on freight rates is unknown, but it renders navigation safer between Swan Quarter and points on Pamlico River.

The balance of the funds on hand will be used for maintenance of the improvement.

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[1] Exclusive of amount available for fiscal year 1913.

July 1, 1911, balance unexpended	$6,816.17
June 30, 1912, amount expended during fiscal year, for works of improvement	792.15
July 1, 1912, balance unexpended	6,024.02
July 1, 1912, outstanding liabilities	50.00
July 1, 1912, balance available	5,974.02

(See Appendix M 4.)

5. *Pamlico and Tar Rivers, N. C.*—(One river, called the Pamlico below Washington, N. C., and the Tar above that point.) Distance from Washington to Greenville, 22 miles; to Tarboro, 48 miles; to Fishing Creek, 56 miles; to Little Falls, 82 miles; to Rocky Mount, 84 miles.

The river rises in Person County, flows in a general southeasterly direction, and empties into Pamlico Sound. Total length, about 217 miles. Section under improvement, mouth to Little Falls, 82 miles.

Prior to its improvement, which was begun in 1876, the Pamlico River (that portion of the stream below Washington) was obstructed by war blockades, sunken logs, snags, stumps, and sand shoals.

The governing low-water depths were 5 feet at mean low water to Washington and perhaps 1 foot to Tarboro, the navigation to which place was practicable during freshet stages only. About 3 feet could be carried to Tarboro during about eight high-water months per year.

The original project for the improvement of the river below Washington was that submitted in December, 1875 (Annual Report of the Chief of Engineers for 1876, p. 361), and adopted by Congress August 14, 1876, and had for its object to provide 9 feet at low water, from Washington to its mouth, by dredging and the removal of piles and obstructions, at an estimated cost of $28,050. In the project proper the proposed draft to be provided was not specified, but work under the project was devoted to securing 9 feet at mean low water. Under this project the sum of $18,000 was appropriated, of which $17,877.12 was expended; the remainder, $122.88, was transferred to the improvement of the Pamlico and Tar Rivers, when the improvements were combined in 1880.

The Tar River (that portion of the stream above Washington) prior to improvement was obstructed by sunken logs, piles, wrecks, stumps, snags, and trees in the channel, and overhanging trees along its banks. The original project for this portion of the stream was that of 1879 (Annual Report of the Chief of Engineers for 1879, p. 700) for the removal of obstructions between Washington and Tarboro at an estimated cost of $10,000. An appropriation of $3,000 was made for this purpose in 1879, of which $2,867.27 was expended, leaving a balance of $132.73, which was transferred to the joint improvement.

In 1889 the project was extended to clear the natural channel above Tarboro, 34 miles, to Little Falls, and the estimate was increased $16,200, making the total estimate $92,200.

The project as modified by act of March 2, 1907, in accordance with plan printed in House Document No. 342, Fifty-ninth Congress, second session, changed the depth between Washington and Greenville from 3 to 4 feet at mean low water, at an estimated cost of $3,800.

The project was again modified by the river and harbor act approved July 25, 1912, in accordance with House Document No. 270, Sixty-second Congress, second session, to secure an available channel depth of 10 feet, and a channel width of 200 feet up to Washington, and a depth of 6 feet with width of 75 feet thence to Greenville, at an estimated cost of $94,050, and $3,500 annually for maintenance.

Expended prior to 1876 on previous projects, $15,000.

Reference to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to Washington					1876 [1]	361-363
Washington to Tarboro	House	[1] 68	Forty-fifth	Third	1879 [1]	700-702
Above Tarboro					1889 [1]	1130-1132
Washington to Greenville	House	[1] 62	Fifty-third	Third	1895 [1]	1365-1366
Mouth to Washington	do	[1] 5	Fifty-fifth	First	1897 [1]	1425-1427
Washington to Greenville	do	[1] 342	Fifty-ninth	Second		
From 10 miles below Washington to Tarboro	do	[2] 270	Sixty-second	do		

[1] No maps.

[2] Contains maps.

The present project is that of 1875 (for Pamlico River) and of 1879, 1889, and 1907 (for Tar River), and 1912, modified to secure a channel 200 feet wide and 10 feet deep at mean low water to Washington; thence a channel 75 feet wide and 6 feet deep to Greenville; thence a channel 60 feet wide and 20 inches deep at low water to Tarboro; thence to keep clear of obstructions the natural channel to Little Falls.

The expenditures during the year were $5,396.95, all for maintenance. The work consisted of snagging operations in the channel between the seventeenth mileboard above Washington and the mouth of Fishing Creek, and dredging from shoals above the County Bridge at Washington, which resulted in putting the channel in fair condition; 4,078 cubic yards of material were removed.

Expended on present project to June 30, 1912:

For improvement	$149,875.33
For maintenance	36,803.11
	186,678.44

The project of 1875, with its various modifications, is completed, except the 1912 modified project. At the beginning of the fiscal year there was a channel to Washington 100 feet wide and 9 feet deep at mean low water; thence to Greenville a channel 60 feet wide and 4 feet deep at low water, which is in good condition.

The stream is nontidal. Below Washington the only surface variations of importance are due to the wind, with an extreme range of 3 feet under normal conditions. Long protracted easterly or westerly winds sometimes cause variations of 7 or 8 feet. The variations of the upper portion of the river are affected by freshets only.

The head of steamboat navigation is the mouth of Fishing Creek, 56 miles above Washington, but logging and rafting may be carried to Dunbars Bridge, 108 miles from the mouth.

The commerce for the year 1911 amounted to 339,522 short tons, valued at approximately $6,950,513, an increase as compared with 1910, of 70,705 tons. It consisted principally of cotton, cottonseed products, grain, potatoes, wood, timber, lumber, fertilizer, and general merchandise.

The tendency of the improvement is to keep down freight rates.

It is proposed to apply the available balance to completing the improvement and to maintenance of the improvement from Greenville to the mouth of Fishing Creek.

July 1, 1911, balance unexpended	$7,079.26
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	5,396.95
July 1, 1912, balance unexpended	1,682.31
July 1, 1912, outstanding liabilities	1,255.28
July 1, 1912, balance available	427.03
Amount appropriated by river and harbor act approved July 25, 1912	100,000.00
Amount available for fiscal year ending June 30, 1913	100,427.03

(See Appendix M 5.)

6. Bay River, N. C.—This stream is properly an arm of Pamlico Sound, emptying into same between the mouths of the Neuse and Pamlico Rivers. It is about 20 miles long, and lies in Pamlico County, flowing in a general southeasterly direction. A 10-foot channel existed originally from its mouth for a distance of 11 miles. From the head of the 10-foot channel to Bayboro, 6 miles above, the channel was obstructed by several shoals, over which about 6 to 7½ feet could be carried at ordinary stages of the water. The upper portion was partially obstructed by mud flats.

The stream is 3 miles wide at its mouth, which is unobstructed by bars. The width gradually decreases to about 80 to 100 feet at Bayboro. The town of Vandemere is 10 miles from the mouth of the river; Stonewall, 15 miles; and Bayboro, 17 miles.

The present and only project for improvement, adopted by the river and harbor act approved June 25, 1910, contemplated dredging a channel 150 feet wide and 10 feet deep at mean low water through the shoals from a point 3,500 feet below Stonewall to deep water; to widen places where the existing 10-foot channel does not equal that width to the same width, and from the above-mentioned point to Bayboro to dredge a channel 100 feet wide and 10 feet deep at mean low water, at an estimated cost of $21,000, with $1,000 annually for maintenance, in accordance with report (without maps) printed in House Document No. 583, Sixty-first Congress, second session.

There was no work done during the year. The expenditures were $6,448.27, all for improvement and were for liabilities incurred during the previous fiscal year.

Amount expended up to June 30, 1912, all for improvement, $21,000.

The project has been about 98 per cent completed, the work having been stopped on account of lack of funds. No deterioration in the dredged channels has occurred, and 10 feet was the maximum draft that could be carried to Bayboro at mean low water on June 30, 1912.

The stream is nontidal and has but little current. Variations in the water level, due to winds, seldom exceed 1 or 2 feet higher or lower than the mean stage.

The head of navigation for all practical purposes is Bayboro, 17 miles from the mouth. Logging and rafting may be carried on for about a mile above Bayboro.

The commerce for 1911 amounted to 18,747 short tons, valued at $430,105, a decrease below that of last year of 7,017 tons. It consisted principally of fertilizers, lumber, and farm products. The result of the improvement is a slight reduction in freight rates.

The additional appropriation will be applied to maintenance.

July 1, 1911, balance unexpended	$6,448.27
June 30, 1912, amount expended during fiscal year, for works of improvement	6,448.27
Amount appropriated by river and harbor act approved July 25, 1912	1,000.00
Amount available for fiscal year ending June 30, 1913	1,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]1,000.00

(See Appendix M 6.)

7. *South River, N. C.*—A tributary of Pamlico River, rises in Beaufort County, flows in a general northeasterly direction, and empties into Pamlico River, about 28 miles below Washington, N. C. Length about 13 miles. Section under improvement, Aurora to a point 1½ miles below Aurora and 9½ miles above its mouth. Before improvement began an 8-foot channel, 400 to 600 feet wide, extended from the mouth a distance of 8½ miles. A 7-foot channel extended about a mile farther, and a 6-foot channel to a point near Aurora, 11 miles above the mouth.

The present and only project for improvement, adopted by the river and harbor act approved June 25, 1910, is in accordance with report printed in House Document No. 954, Sixtieth Congress, first session (with map), and contemplated securing a channel 100 feet wide and 7 feet deep at mean low water from Aurora to the head of the 7-foot channel, with necessary widening of the channel at the bends, at an estimated cost of $16,000, with $800 annually for maintenance after completion.

No field work was done during the year. The expenditures for the year was $5,029.85, all for improvement, and were for liabilities incurred during the previous fiscal year, collecting commercial statistics and for office expenses.

Amount expended on the project up to June 30, 1912, all for improvement, $5,578.50.

The project has been completed. So far as known, no deterioration has occurred in the dredged channels and 7 feet is the maximum draft that can be carried to Aurora at mean low water on June 30, 1912.

The stream has little current and no tide. The ordinary variation of water level due to winds and rain is 18 inches; extreme variation, 3 feet.

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[1] Exclusive of amount available for fiscal year 1913.

The head of navigation is Idalia, about 2 miles above Aurora and 13 miles from the mouth of the river.

The commerce for 1911 amounted to 44,350 short tons, valued at $370,382.50, an increase over last year of 18,279 tons, or about 71 per cent. It consisted principally of timber and fertilizers.

The improvement has had a beneficial effect on freight rates.

It is proposed to expend the available balance for maintenance by dredging where shoaling occurs.

July 1, 1911, balance unexpended	$15,451.35
June 30, 1912, amount expended during fiscal year, for works of improvement	5,029.85
July 1, 1912, balance unexpended	10,421.50
July 1, 1912, outstanding liabilities	100.00
July 1, 1912, balance available	10,321.50

(See Appendix M 7.)

8. Contentnia Creek, N. C.—A tributary of Neuse River, rises in Wilson County, flows in a general southeasterly direction, and empties into the Neuse River about 32 miles above Newbern. It is about 144 miles long. Section under improvement, mouth to Stantonsburg, 63 miles. Distance from the mouth to Snow Hill, 31½ miles; Speights Bridge, 50½ miles.

Previous to improvement this stream had a depth of about 3 feet during 9 months of the year from its mouth to Stantonsburg, but was obstructed throughout its entire length by fallen timber, sand shoals, and overhanging growth, and was navigable for shallow-draft craft only during the higher freshet stages of about 3 to 6 months of the year.

The original project of 1881 was to clear the stream of these obstructions so as to obtain from its mouth to Stantonsburg a depth of not less than 3 feet during the higher stages, about 9 months of the year, at a cost estimated in 1888 at $77,500.

The project of 1881 as extended in 1894 included maintenance below Snow Hill and was again extended in 1899 to include maintenance from Stantonsburg to the mouth. The project has been completed, and additional work required is for maintenance.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to Stantonsburg	House	[1] 85	Forty-sixth	Third	1881 [1]	1010-1012
Do					1887 [2]	1013
Mouth to Snow Hill					1896 [1]	1106
Mouth to Stantonsburg					1901 [1]	301

[1] No maps.

[2] Contains maps.

The expenditures during the year were $1,355.40, all for maintenance. The work consisted of snagging operations between the mouth of the creek and Snow Hill.

Amount expended up to June 30, 1912:	
For improvement	$64, 394. 56
For maintenance	14, 559. 69
Total	78, 954. 25

Received from rents, sales, etc., $302.

At the close of the fiscal year the creek between its mouth and Snow Hill was in good condition and could be navigated during six months of the year by boats drawing about 3 feet, depending upon the rainfall. Snow Hill, 31½ miles from its mouth, is practically the head of navigation, although, during the higher stages of water, boats can ascend the stream to Speights Bridge, 50½ miles from its mouth, and logging and rafting can be carried on several miles above this point.

The stream is subject to freshets, rising 15 feet above low water at Snow Hill and Stantonsburg.

The commerce for the year 1911 amounted to 16,135 short tons, valued at approximately $191,150, a decrease of 7,834 tons below last year. It consisted principally of cotton, cottonseed, timber, fertilizer, etc.

The effect of the improvement on railroad and boat rates can not be definitely stated, but the stream when opened to navigation affords an outlet to farm products, timber, lumber, etc., which have no other outlet except by wagon.

It is proposed to apply the available balance to maintenance by snagging.

July 1, 1911, balance unexpended	$1, 703. 15
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1, 355. 40
July 1, 1912, balance unexpended	347. 75
July 1, 1912, outstanding liabilities	50. 00
July 1, 1912, balance available	297. 75
Amount appropriated by river and harbor act approved July 25, 1912	2, 000. 00
Amount available for fiscal year ending June 30, 1913	2, 297. 75

(See Appendix M 8.)

9. Smiths Creek, N. C.—A small tributary of Neuse River, rises in Pamlico County and flows into the latter stream on the north side at the town of Oriental, about 10 miles from the mouth of Neuse River and opposite the mouth of Adams Creek, the northern terminus of the waterway from Pamlico Sound to Beaufort Inlet.

It flows in a general easterly direction. It is about 5 miles long, and is navigable 2 or 3 miles above its mouth, but there is very little commerce on it, the section to be improved being limited to its mouth, the harbor of Oriental. A 10-foot channel, not less than 100 feet wide, exists from Neuse River to the wharves in Oriental, but is crooked at the entrance to Neuse River. The interior harbor is very narrow and obstructed by large mud flats in front of the town. The entrance is obstructed by two shoals which overlap each other. A small shallow bay just east of mouth of river extends back into the town.

The present and only project for improvement, adopted by the river and harbor act of June 25, 1910, contemplates the excavation of a basin in the small bay located in the center of the town and just inside the mouth of the creek to a depth of 10 feet at mean low water and removing several lumps and projecting points in the entrance channel at an estimated cost of $16,250, with $1,000 annually for maintenance, in accordance with plan printed in House Document No. 774, Sixty-first Congress, second session (contains map). The plan further provides for the construction by local interests of a bulkhead of sheet piling, in two rows 300 feet apart, for the deposit of dredged material, which will protect the harbor thus formed from rough water outside.

The work of the year consisted of making preliminary surveys preparatory to beginning dredging operations under contract. The expenditures were $191.06, all for improvement. The bulkhead required to be constructed by local interests before dredging operations begin was nearly completed in June.

Amount expended on project up to June 30, 1912, all for improvement, $447.28.

There is practically no tide on the stream. Variations in water levels due to winds sometimes amount to 3 feet.

The commerce for the year amounted to 17,168 short tons, valued at $235,994, a decrease of 13,423 tons below last year. The decrease in commerce was due to the shipment of much lumber by rail formerly shipped by water.

July 1, 1911, balance unexpended	$15,993.78
June 30, 1912, amount expended during fiscal year, for works of improvement	191.06
July 1, 1912, balance unexpended	15,802.72
July 1, 1912, amount covered by uncompleted contracts	13,650.00

(See Appendix M 9.)

10. Neuse and Trent Rivers, N. C.—(*a*) *Neuse River.*—A tributary of Pamlico Sound, rises in the northern part of North Carolina and flows in a southeasterly direction, passing near Durham, Raleigh, and Goldsboro, until it reaches Kinston; its direction then changes to the northeast until it reaches the mouth of Contentnia Creek, when it again changes to the southeast and continues so for 20 miles past Newbern, when it again changes to the northeast and continues so until it flows into Pamlico Sound at its southern extremity. Its total length is about 350 miles. The section under improvement is from 10 miles below Newbern to Smithfield, 150 miles above.

There is considerable uncertainty as to the conditions existing prior to 1878, when improvement by the Government was begun. Before the Civil War, and probably for sometime afterwards, light-draft steamers made more or less regular trips as high up as Smithfield, but the low-water depth probably did not exceed 2 feet, and the stream was obstructed by snags, and after the Civil War by war blockades. (See Annual Report of the Chief of Engineers for 1905, p. 240.)

The original project of 1871, as extended in 1878–79 and 1880 and continued to date, provides for an 8-foot navigation up to Newbern during the entire year, 4 feet to Kinston, and during nine months of the year 3 feet to Smithfield, by the removal of war obstructions, dredging, jettying, and snagging, at a total estimated cost of $374,000; extended in 1902 (H. Doc. No. 317, 54th Cong., 2d sess.) to include dredging a channel 300 feet wide below Newbern and 200 feet wide at Newbern, to a depth of 8 feet at dead low water, in accordance with report and estimate printed in Annual Report of the Chief of Engineers for 1897, page 1427, at an estimated additional cost of $59,081.25. Since its adoption this additional estimate has been reduced to $24,000.

In 1902 the improvement of this river was combined with that of the Trent.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Below Goldsboro	Senate	[1] 23	Forty-second	Second	1872 [2]	734–741
Mouth to Goldsboro					1876 [2]	863–867
Smithfield to Goldsboro	House	[2] 68	Forty-fifth	Third	1879 [2]	708–710
At and below Newbern	do	[2] 317	Fifty-fourth	Second	1897 [2]	1427–1429
Goldsboro to Newbern	do	[2] 648	Fifty-eighth	do	1904 [2]	1525–1587
Pamlico Sound to Newbern	do	[2] 1003	Sixty-first	Third		

[1] Contains maps.

[2] No maps.

The present project, with its various modifications, provides for an 8-foot depth to Newbern at dead low water during the entire year, 4 feet to Kinston, and during nine months of the year 3 feet to Smithfield, including a channel 300 feet wide below Newbern, 200 feet wide at Newbern, and 8 feet deep at dead low water.

The work of the year consisted of dredging and snagging by Government plant and hired labor. There were removed from Hampton Shoal 40,396 cubic yards of material and 18,666 cubic yards from Blockade Shoal, 4 miles above Newbern. The river was snagged between the tenth and fifty-ninth mileposts.

The expenditures for the year were $15,200.89, all for improvement.

Amount expended on foregoing projects to June 30, 1912:	
For improvement	$347, 248. 47
For maintenance	37, 772. 41
Total	385, 020. 88

Received from sales, etc., $958.33.

The improvement above Newbern is completed to the practical limits of the existing project. The percentage of completion of the project as stated is uncertain. Below Newbern the cut through Hampton Shoal is about 15 per cent completed.

As a result of the expenditures to date the channel at and below Newbern has been partially completed to project width and depth; all war blockades have been cleared away, and the natural channel has been cleared to Smithfield, 150 miles above Newbern. No attempt has been made to maintain the stream above Waynesboro Landing (Goldsboro), 98¼ miles above Newbern. At low water 8 feet can be carried to Newbern, 4 feet to Biddles Landing, 27½ miles above, 2.5 feet to the mouth of Contentnia Creek, 31½ miles above Newbern, and 1 foot to Kinston, 50 miles above Newbern, above which point the river is only navigable on freshet stages of 2 to 3 feet.

A channel known as the Western Channel, immediately above Newbern, has been dredged to a depth of 4 feet at dead low water.

The channel of the river between Newbern and Seven Springs, near Whitehall, is in good condition.

The practical head of navigation is Maple Cypress, 25 miles above Newbern, except during freshet stages, when navigation is possible to Waynesboro Landing, about 136 miles from the mouth. There is practically no commerce above Seven Springs, 75 miles from the mouth.

The stream is nontidal. The variations of the water surface below Newbern are due entirely to the influences of the wind and vary from 3.3 feet below mean low water during severe northwest winds to 5 feet above during violent northeast gales. The upper river is subject to freshets, which rise 17 feet at Smithfield, 18 feet at Waynesboro Landing, and 20 feet at Kinston.

The commerce for the year amounted to 408,206 short tons, valued at $8,952,226, an increase of 55,035 tons over last year. It consisted of grain, timber, fertilizers, general merchandise, etc.

Freight rates are materially lessened by reason of the improvement.

The appropriation recommended will be applied to building scows, dredging through Hampton Shoal below Newbern, and snagging above Newbern.

July 1, 1911, balance unexpended	$15,388.34
June 30, 1912, amount expended during fiscal year, for works of improvement	15,200.89
July 1, 1912, balance unexpended	187.45
July 1, 1912, outstanding liabilities	50.77
July 1, 1912, balance available	136.68
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	2,000.00
Amount available for fiscal year ending June 30, 1913	2,136.68
Amount (estimated) required to be appropriated for completion of existing project	[1] 72,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	([2])

(*b*) *Trent River.*—A tributary of Neuse River is formed by the junction of Beaver Dam and Tuckahoe Creeks, in Jones County. Its length, including the two creeks named, is about 80 miles (about 40 miles in an air line). It flows in an easterly direction through Jones County and Craven County, emptying into the Neuse River at Newbern. Section under improvement, from the mouth to upper Quaker Bridge, 78 miles. Distance from the mouth at Newbern to Pollokssville, 18 miles; to lower Quaker Bridge, 27 miles; to Trenton, 38 miles. Its original condition was a channel of 6 feet depth, roughly cleared, to Polloksville, and the stream was fairly clear to lower Quaker Bridge for light-draft navigation, above which point it was badly obstructed, which prevented all navigation, except occasionally by small flatboats during high freshets.

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[1] Exclusive of amount available for fiscal year 1913.
[2] See consolidated money statement on page 437.

The original project of 1879 (see Annual Report of the Chief of Engineers for 1879, p. 711, and H. Ex. Doc. No. 68, 45th Cong., 3d sess.) was to secure 3 feet depth at low water to Trenton; extended in 1886 to obtain 8 feet depth through Foys Flats; extended in 1889 to clear out obstructions to upper Quaker Bridge, 40 miles above Trenton. The sum of $64,262.64 was expended on this project and its modifications.

In 1896 the project of 1879 was amended to provide for the maintenance of a channel only 30 feet wide and 3 feet deep from Newbern to Trenton, at an annual estimated cost of $2,500. This was extended in 1902 (H. Doc. No. 121, 56th Cong., 2d sess.) to include dredging at Newbern to 8 feet depth at dead low water from harbor line to channel, at an estimated cost of $24,000 additional. In 1902 the improvement of this river was combined with that of the Neuse. This project has been completed.

By joint resolution approved March 4, 1907, authority was given to expend such portion of the appropriation made in river and harbor act of March 2, 1907, as may be necessary for securing a channel 6 feet deep over Foys Flats in the Trent River, about 4 miles above Newbern. This work has been done, and practically affords a 10-foot channel at mean low water to Polloksville.

The river and harbor act of June 25, 1910, authorized a further improvement of the river by dredging a channel 4 feet deep from Newbern to Trenton, and by removing obstructing stumps and bank snags at an estimated cost of $15,000, with $2,000 annually for maintenance after completion, in accordance with plan submitted in House Document No. 1471, Sixtieth Congress, second session.

References to examination and survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Newbern to Trenton	House	68	Forty-fifth	Third	1879 [1]	711-714
Trenton to upper Quaker Bridge					1889 [1]	1140-1142
Newbern to Trenton	House	[1] 121	Fifty-sixth	Second	1901 [1]	1545-1552
Do	do	[1] 1471	Sixtieth	do		
Mouth to Quaker Bridge	do	[1] 1092	Sixty-first	Third		

[1] No maps.

The existing project provides for securing a channel 8 feet deep at dead low water at Newbern; maintaining a channel 50 feet wide and 4 feet deep at low water to Trenton; and securing a channel 6 feet at dead low water over Foys Flats.

The expenditures for the year were $10,409.25, of which $9,935.77 was for improvement, and $473.48 for maintenance. The work consisted of dredging 15,108 cubic yards of rock between the twenty-eighth milepost and Trenton, by hired plant, which resulted in completing a channel with a minimum depth of 4 feet, but not uniformly of project width. Dredging was also carried on by Government plant and 1,274 cubic yards of material were removed from Foys Flats between the fourth and sixth mile posts, restoring the channel to the project depth of 9.3 feet at mean low water.

Amount expended on existing project up to June 30, 1912:	
For improvement	$35,753.55
For maintenance	26,568.06
Total	62,321.61

Received from sales, etc., $835.

The improvement above Trenton has been abandoned. The project is 83 per cent completed.

Between Trenton and Newbern, a 4-foot channel exists, and the stream is in fair condition, but the full project width has not yet been obtained on account of lack of funds. Unforeseen conditions of weather and character of material increased cost so that project could not be completed within project estimate. The maximum draft at mean low water that can be carried June 30, 1912, to Polloksville, 18 miles above the mouth, is 9.3 feet, to lower Quaker Bridge, 9 miles farther, 6.5 feet, and to Trenton, 38 miles above the mouth, 4 feet.

Near the mouth, the water level varies about 3 feet under normal conditions, according to the prevailing winds. Long protracted easterly or westerly winds sometimes cause a variation of 7 or 8 feet. At Trenton the stream is subject to freshets of about 5 to 15 feet during the winter months.

The head of navigation is Trenton. Above Trenton, logging and rafting can be carried on a short distance. The commerce for the year 1911 amounted to 164,808.5 short tons, valued at $5,007,498, an increase of 12,496.5 tons over last year.

The commerce carried consisted principally of fertilizers, general merchandise, machinery, timber, lumber, etc.

The effect of this improvement on freight rates is not known, but it affords transportation facilities to the town of Trenton, which has no other means except by wagon.

The additional appropriation recommended will be applied to maintenance.

July 1, 1911, balance unexpended		$10,410.00
June 30, 1912, amount unexpended during fiscal year:		
For works of improvement	$9,935.77	
For maintenance of improvement	473.48	
		10,409.25
July 1, 1912, balance unexpended		.75
July 1, 1912, outstanding liabilities		.75

Amount allotted from appropriation made by river and harbor act approved July 25, 1912		$8,000.00
Amount available for fiscal year ending June 30, 1913		8,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		(1)

CONSOLIDATED.

July 1, 1911, balance unexpended		25,798.34
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$25,136.66	
For maintenance of improvement	473.48	
		25,610.14
July 1, 1912, balance unexpended		188.20
July 1, 1912, outstanding liabilities		51.52
July 1, 1912, balance available		136.68
Amount appropriated by river and harbor act approved July 25, 1912		10,000.00
Amount available for fiscal year ending June 30, 1913		10,136.68
Amount (estimated) required to be appropriated for completion of existing project		[2] 72,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[2] 12,000.00

(See Appendix M 10.)

11. Swift Creek, N. C.—A tributary of Neuse River, rises in Pitt County and flows in a southeasterly direction, almost parallel to Contentnia Creek, into Craven County, to a point about 8 miles below Vanceboro, when it turns and flows southwest for about 5 miles, emptying into the Neuse River about 8 miles above Newbern. The section under improvement is from the mouth to Vanceboro. For 6 miles above its mouth this stream was in good condition before improvement, having an average width of 100 feet and least low-water depth of 10 feet. In the next 8 miles, to the town of Vanceboro, the least low-water depth is 6 feet and width from 50 to 150 feet, averaging about 80 feet. This upper 8 miles was rather crooked, with three bad bends, and was originally badly obstructed by logs, snags, etc., and overhanging trees. The narrowest part is the Thoroughfare, about 5 miles below Vanceboro.

The only project for improvement, adopted by the river and harbor act of June 25, 1910, contemplated securing a clear channel between the mouth of the river and Vanceboro by the removal of snags and overhanging and leaning trees, at an estimated cost of $1,600, with $500 annually for maintenance, in accordance with plan printed in House Document No. 360, Sixty-first Congress, second session. (No maps.)

No work was done during the year, no money being available.

The expenditures to June 30, 1912, were $1,600, all for improvement.

The project has been completed and a good open channel now exists to the town of Vanceboro. Six feet is the maximum draft that can be carried to Vanceboro, which is the head of navigation, 14 miles above its mouth.

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[1] See consolidated money statement on this page.

[2] Exclusive of amount available for fiscal year 1913.

The rise of water level due to floods sometimes causes considerable currents. The maximum flood height at Vanceboro is about 12 feet.

The commerce for the year 1911 amounted to 22,458 short tons, valued at $320,635. It consisted principally of lumber, timber, fertilizers, and farm products.

The improvement has had a beneficial effect on freight rates.

The additional appropriation recommended will be applied to maintenance by snagging where needed.

Amount appropriated by river and harbor act approved July 25, 1912	$500
Amount available for fiscal year ending June 30, 1913	500
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 500

(See Appendix M 11.)

12. Inland waterway from Pamlico Sound to Beaufort Inlet, N. C.—Distance from the 10-foot mean low-water contour in Adams Creek (a tributary of the Neuse River) to the head of Adams Creek is about 7 miles; from the head of Adams Creek across the country to the head of Core Creek is about 3 miles; from the head of Core Creek to the mouth of Core Creek is about 4 miles; and the distance from the mouth of Core Creek to the 10-foot depth at mean low water in the Newport River is about 4 miles, making the total distance over which dredging was required about 18 miles.

At the time of the adoption of the existing project a low-water depth of about 5 feet could be carried from the 10-foot contour in Adams Creek to near its head; from the head of Adams Creek to the head of Core Creek was across dry land; from the head of Core Creek to its mouth the creek was practically bare at low water, and from the mouth of Core Creek to the 10-foot contour in Newport River the low-water depth formerly averaged about 6 feet.

The present and only project, adopted by act of Congress approved March 2, 1907 (H. Doc. No. 84, 59th Cong., 2d sess.), contemplates securing, by dredging, a channel 10 feet deep at low water from Pamlico Sound to Beaufort Inlet via Adams and Core Creeks, said channel to have a minimum bottom width of 90 feet through dry land with side slopes of 1 to 2½, a minimum bottom width of 125 feet with side slopes of 1 to 3 through narrow parts of the creek and river portions, and a minimum bottom width of 250 feet with side slopes of 1 to 3 in wide parts of creeks and sounds, at an estimated cost of $550,000.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entire waterway	House	[2] 84	Fifty-ninth	Second		
Do					1904 [2]	1401-1402

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[1] Exclusive of amount available for fiscal year 1913.

[2] No maps.

The project has been completed. Additional work will be for maintenance. Some deterioration in the waterway has occurred, due to caving in of the banks.

The expenditures for the year were $9,267.01, of which $2,108.15 was for maintenance. The work consisted of completing the construction of the concrete fender piers for Core Creek Bridge under contract, operation and maintenance of the bridge, and subdividing the right of way preparatory to leasing same. Four tracts of land acquired at the end of last fiscal year were paid for, which completed the acquisition of 583.28 acres of right of way, at an average cost of $14.42 per acre.

Amount expended on the project up to June 30, 1912:	
For improvement	$502,078.63
For maintenance	3,590.02
Total	505,668.65

Received from sales, rents, etc., $1.50.

The entire waterway has been completed. During the year 3,084 steamers, yachts, and other vessels passed through the waterway. The draw in Core Creek Bridge was opened 2,141 times.

The funds in hand will be used for maintenance in care and operation of the drawbridge and for snagging.

July 1, 1911, balance unexpended		$18,598.36
Amount received from sales during fiscal year		1.50
		18,599.86
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$7,158.86	
For maintenance of improvement	2,108.15	
		9,267.01
July 1, 1912, balance unexpended		9,332.85
July 1, 1912, outstanding liabilities		199.25
July 1, 1912, balance available		9,133.60
Amount appropriated by river and harbor act approved July 25, 1912		2,000.00
Amount available for fiscal year ending June 30, 1913		11,133.60

(See Appendix M 12.)

13. Waterway between Newbern and Beaufort, N. C. (via Neuse River, Clubfoot Creek, Clubfoot and Harlowe Canal (private), Harlowe Creek, and Newport River).—Distances: Newbern to Clubfoot Creek, 20 miles; thence to Clubfoot and Harlowe Canal, 6 miles; thence to Harlowe Creek, 3.2 miles; thence to Newport River, 3¼ miles; thence to Beaufort, 7 miles.

The first appropriation for this work was made by the river and harbor act of 1882, which provided that $5,000 from the appropriation for Neuse River and a like sum from the appropriation for Beaufort Harbor should be "applied to the improvement of the line of inland navigation from Newbern to Beaufort Harbor."

No estimate or project for said improvement had at that time been made, but in October, 1883 (Annual Report of the Chief of Engineers for 1884, p. 1067), an estimate was prepared which contemplated a channel 80 feet wide and 9 feet deep, at an estimated cost of $883,580, exclusive of the cost of a tide lock and of the canal company's franchise and property.

The available funds being totally inadequate for this improvement, the project adopted in 1884 for the expenditure of said funds contemplated a channel 30 feet wide and 5 feet deep at mean low water, the estimated cost being $92,000.

This project of 1884 constitutes the existing project.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entire waterway					1884 [1]	1065-1071
Do					1890 [2]	1127-1131

[1] No maps.

[2] Contains maps.

All work of improvement has been confined to the natural channels in Clubfoot and Harlowe Creeks and Newport River.

There was no work done during the year, no money being available.

The expenditures to date have amounted to $37,000, of which $29,739.84 was for improvement and $7,260.16 was for maintenance.

The governing depth in Harlowe Creek was increased several years ago to the project depth of 5 feet, but for lack of maintenance had decreased to about 1 foot in 1905. During the fiscal year 1907 the shoal at the mouth of the creek was redredged to the project depth, but another shoal of less consequence was left inside the creek. The channel in Clubfoot Creek had never been dredged until the fiscal year 1906. Some snagging, etc., had been done in both creeks, but no work in the canal connecting the two creeks has ever been done by the Government, since said canal is owned by a corporation.

The dredged cut at the mouth of Harlowe Creek has deteriorated considerably since its completion. The controlling depth at mean low water is now 2 feet, the shoalest place being near the mouth of Harlowe Creek; but at high water about 3 feet can be carried, shoalest water being in the canal.

No additional appropriation is needed for this waterway, as the inland waterway from Pamlico Sound to Beaufort Inlet is completed and takes the place of this route, the abandonment of which is recommended. Annual report of this improvement will be discontinued.

The commerce for the year 1911 amounted to 14,799.5 short tons, valued at approximately $253,171, showing a decrease below the commerce for 1910 of 22,089.5 tons. This commerce consisted principally of cotton, cotton seed, oysters, clams, timber, lumber, and general merchandise.

(See Appendix M 13.)

14. *Harbor of refuge at Cape Lookout, N. C.*—Cape Lookout is the middle one of the three prominent capes on the coast of North Carolina. A triangular-shaped area of beach projects into the ocean in a southerly direction for about 3 miles and forms the cape. This area is connected with the general line of the coast by a narrow neck

of land on the eastern side of the triangle, and the body of water extending behind the western point of the triangle, called Western Point, forms the harbor of Lookout Bight. Vessels drawing not over 15 feet can enter.

Beaufort Harbor is the nearest harbor of importance and is 8 miles to the westward. From Cape Lookout to the mouth of the Cape Fear River is 120 miles to the southwest. Norfolk is about 180 miles to the north.

The present and only project adopted by the river and harbor act approved July 25, 1912, provides for the construction of a harbor of refuge inclosing 575 acres of 30 feet or more in depth, in accordance with report printed in House Document No. 528, Sixty-second Congress, second session, or such modification of the plan contained in said report as may be deemed advisable after examination and survey, at an estimated cost of $3,526,600.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Whole harbor	House	[1] 819	Fifty-third	Third	1895 [2]	1876
Do	Senate	[2] 122	Fifty-fourth	First		
Do	House	[1] 25	Fifty-fifth	Second	1897 [1]	1430
Do	do	[1] 80	Fifty-sixth	First	1900 [2]	1829
Do	do	[2] 315	Sixty-first	Second		
Do	do	[2] 528	Sixty-second	do		

Amount appropriated by river and harbor act approved July 25, 1912	$300,000
Amount available for fiscal year 1913	300,000
Amount required to be appropriated for completion of existing project	[3] 3,226,600
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[3] 1,100,000

15. *Harbor at Beaufort, N. C.*—When improvement (begun in 1836) was resumed in 1881, the erosion at Fort Macon and Shackelford Points was causing serious deterioration of the inside channels and threatening deterioration of the bar channel. The governing low-water depth is said to have been 15 feet on the bar and 2 feet at Beaufort, N. C.

Newbern is 43 miles by water west from Beaufort; Southport, at the mouth of the Cape Fear River, is 120 miles to the southwest; Cape Lookout, 8 miles east.

The original project is that of 1881, to stop erosion at the inlet (Fort Macon and Shackelford Points) by jetties and to provide a channel 200 feet wide and 9 feet deep at ordinary low tide to Beaufort and a channel 100 feet wide and 6 feet deep from Beaufort to the 6-foot contour of the channel leading up North River, estimated to cost $82,103.38, increased in 1885 to $159,000, when the project was modified by reducing the channel to Beaufort to 100 feet and its depth to 5 feet at mean low water and eliminating the channel east from Beaufort. In 1887 the estimate for the above work was further increased to $163,000.

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[1] Contains maps. [2] No maps. [3] Exclusive of amount available for fiscal year 1913.

The project was again modified in 1890, the project depth of the Bulkhead channel being increased to 7 feet. The project as modified was completed.

The amount expended under the original project as modified was $148,843. To the above amount should be added $5,000, appropriated July 4, 1836, making the total cost up to the completion of the original project $153,843.

The existing project of 1896 includes the maintenance of jetties and sand fences at Fort Macon and Shackelford Points and the maintenance of the 7-foot channel across Bulkhead Shoal, and thence to the wharves at Beaufort. The object of the jetties and sand fences is to protect the land on the opposite sides of the inlet, thus preventing the inlet from shifting and deteriorating.

The jetties have been successful in preventing the inlet from widening and shifting, but deterioration of the depths obtained in the main channel is quite rapid, due to the fact that the inlet is still too wide to enable its tidal discharge to keep the channel scoured out to the proper depth.

The river and harbor act of March 2, 1907, authorized a sufficient amount of the appropriation made therein to be applied to repairing existing jetties at Fort Macon Point and constructing additional jetties and shore protection.

The river and harbor act of June 25, 1910, modified the project and authorized the expenditure of $27,676 for the construction of a channel from the inland waterway between Pamlico Sound and Beaufort Inlet to the town of Beaufort, by way of Gallants Channel, in accordance with report submitted in House Document No. 511, Sixty-first Congress, second session, at an estimated cost of $27,676, with $1,500 annually for maintenance, and authorized any unexpended balance of the appropriation to be used for constructing a turning basin in front of the town of Beaufort.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Shackelford Point and Harbor proper	House	[1] 78	Forty-sixth	Third	1881 [1]	1013-1017
Shackelford Banks					1882 [1]	1094
Fort Macon and Shackelford Point					1885 [2]	1076-1082
Bulkhead Channel					1887 [1]	1083
Do					1891 [1]	1368-1369
Breakwater	House	[1] 246	Fifty-second	Second	1893 [1]	1457-1461
Inlet	do	[2] 1454	Sixtieth	do		
Channel from Beaufort to Waterway from Pamlico Sound to Beaufort Inlet	do	[2] 511	Sixty-first	do		

[1] No maps. [2] Contains maps.

The existing project provides for the maintenance of jetties and sand fences at Fort Macon and Shackleford Points; maintenance of the 7-foot channel across Bulkhead Shoal, thence to the wharves at Beaufort; repairs to existing jetties at Fort Macon Point and construction of additional jetties and shore protection; and excavation of a channel 100 feet wide and 10 feet deep at mean low water from Beaufort via Gallants Channel connecting the inland waterway between Pamlico Sound and Beaufort Inlet; also the excavation of a turning basin in front of Beaufort if funds remain available from the appropriation made June 25, 1910.

The expenditures for the year were $18,467.68, of which $4,570.47 was for maintenance, and were for building and maintaining sand fences at Shackleford Point; for extending a stone and oyster shell training wall to maintain a 7-foot channel across Bulkhead Shoal and for dredging a 10-foot channel to Beaufort.

The amount expended on present project for maintenance to June 30, 1912, was $44,457.98, and $15,831.58 for improvement under the modified project of 1910. Received from sales, etc., $726.50.

The project of 1910 is about 66 per cent completed. Length of channel dredged 9,958 linear feet, width 60 feet, depth 10 feet at mean low water.

A draft of 6 feet at mean low water can now be carried to the wharves at Beaufort, due to the action of the training wall.

The tide rises 2.5 feet at Beaufort and 3.5 feet at the inlet.

The commerce for the year 1911 amounted to 74,085 short tons, valued at approximately $2,429,229, an increase over last year of 19,885 tons.

The maintenance of this channel tends to prevent the rise in freight rates by allowing the larger vessels to reach the wharves at Beaufort.

It is proposed to expend the available balance in completing the new 10-foot channel, and in maintenance and the appropriation recommended in maintenance.

July 1, 1911, balance unexpended		$30,736.12
Amount received from sales during fiscal year 1912		1.50
		30,737.62
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$13,897.21	
For maintenance of improvement	4,570.47	
		18,467.68
July 1, 1912, balance unexpended		12,269.94
July 1, 1912, outstanding liabilities		1,873.91
July 1, 1912, balance available		10,396.03
Amount appropriated by river and harbor act approved July 25, 1912		5,000.00
Amount available for fiscal year ending June 30, 1913		15,396.03
July 1, 1912, amount covered by uncompleted contracts		8,420.22
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 5,000.00

(See Appendix M 14.)

16. Beaufort Inlet, N. C.—When improvement began in September, 1905, there was a minimum depth on the bar of approximately 12 feet at mean low water.

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[1] Exclusive of amount available for fiscal year 1913.

The original, which is also the existing project, adopted by Congress in the river and harbor act of March 3, 1905, is printed on page 1415 of the Annual Report of the Chief of Engineers for 1904, and in House Document No. 563, Fifty-eighth Congress, second session. It contemplates a channel 300 feet wide, 20 feet deep at mean low water, across the bar, to be obtained by dredging, at an estimated cost of $45,000. This work was accomplished at a cost of $44,484.24. Amount expended to June 30, 1912, for maintenance, $24,579.84.

The project was completed in December, 1910. The result of this work was to obtain a channel 20 feet deep at mean low water and 300 feet wide across the bar, but has since shoaled until at the end of the fiscal year a depth of about 16.5 feet is available.

No work was done during the year and no money was expended.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Bar	House	[1] 563	Fifty-eighth	Second	1904 [1]	1415
Do	do	[2] 1454	Sixtieth	do		

The commerce for the year 1911 amounted to 32,263 short tons, valued at $283,640, and consisted principally of fish, lumber, and fertilizer.

Compared with the commerce for 1910, this shows a gain of 5,163 tons.

The effect of this improvement will be to lessen freight rates by affording water transportation for products which have hitherto been dependent entirely upon railroads.

This work is designed to provide a deep-water outlet to the ocean for the inland waterway from Pamlico Sound to Beaufort Inlet, N. C.

It is proposed to expend the available balance and additional appropriation recommended in maintenance.

July 1, 1911, balance unexpended	$3,435.92
July 1, 1912, balance unexpended	3,435.92
July 1, 1912, outstanding liabilities	100.00
July 1, 1912, balance available	3,335.92
Amount appropriated by river and harbor act approved July 25, 1912	10,000.00
Amount available for fiscal year ending June 30, 1913	13,335.92
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[3] 10,000.00

(See Appendix M 15.)

17. Harbor at Morehead City, N. C.—Situated on Bogue Sound. The city is separated from deep water in Bogue Sound by mud flats and marine marshes. Between the marshes and the city there is a shallow channel, nearly dry at low water, on which the wharves of the city are built, and which connects with deep water in the sound. The nearest city of importance is Beaufort, about 2½ miles to the eastward.

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[1] No maps. [2] Contains maps. [3] Exclusive of amount available for fiscal year 1913.

The present and only project for improvement, adopted by the river and harbor act of June 25, 1910, contemplated securing a channel, by dredging, 10 feet deep at mean low water, beginning at a point 2,000 feet westward of Beaufort Harbor, and extending up along the wharves at Morehead City for a distance of 3,800 feet, the lower 2,800 feet having a width of 100 feet and the upper 1,000 feet a width of 200 feet, at an estimated cost of $19,000, with $2,000 annually for maintenance, in accordance with plan, with map, printed in House Document No. 649, Sixty-first Congress, second session. This plan also provides for the construction, by local interests, of 500 feet of bulkhead in front of the city, behind which it is proposed to deposit part of the dredged material.

The expenditures for the year were $5,897.52, all for improvement, and were for removing under dredging contract 121,464.6 cubic yards of material from prescribed cross section, and 16,113.7 cubic yards from 1 foot outside. This work resulted in cuts 2,492 feet long and 100 feet wide and 750 feet long, 200 feet wide, and 10 feet deep at mean low water. At the close of the year the project was about 79 per cent completed.

The total expenditures to June 30, 1912, were $6,396.90, all for improvement.

As the result of the year's work, the maximum draft that could be carried to the wharves at Morehead City was 10 feet, whereas prior to the improvement only 3 feet was available.

The average range of tides is about 2.5 feet.

The commerce for the year 1911 amounted to 9,019 short tons, valued at $756,425. It consisted principally of fish, lumber, and farm products.

The available balance will be applied to completing the improvement. It is proposed to apply the additional appropriation recommended to maintenance.

July 1, 1911, balance unexpended	$18, 500. 62
June 30, 1912, amount expended during fiscal year, for works of improvement	5, 897. 52
July 1, 1912, balance unexpended	12, 603. 10
July 1, 1912, outstanding liabilities	9, 091. 39
July 1, 1912, balance available	3, 511. 71
Amount appropriated by river and harbor act approved July 25, 1912	1, 000. 00
Amount available for fiscal year ending June 30, 1913	4, 511. 71
July 1, 1912, amount covered by uncompleted contracts	2, 360. 25
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 2, 000. 00

(See Appendix M 16.)

18. New River, N. C., including inland waterways between Beaufort Harbor and New River and between New River and Swansboro.—The act of March 2, 1907, combined these three improvements under this new heading.

(*a*) *New River.*—New River lies almost wholly within Onslow County. It flows in a general southerly direction and empties into the

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[1] Exclusive of amount available for fiscal year 1913.

Atlantic Ocean through New River Inlet about midway between Cape Lookout and Cape Fear. Total length, 52 miles. Section under improvement, mouth to Jacksonville, 23 miles.

Appropriations amounting to $50,000 were made for the river in 1836, 1837, and 1838, after which no further appropriations were made until 1882, when $5,000 was appropriated. Another appropriation of $5,000 was made in 1884, but since these amounts were considered too small to justify undertaking the improvements no work was done until 1886, when still another appropriation of $10,000 was made.

When improvement began in 1886 the governing low-water depth was 4 feet for a distance of 23 miles to Jacksonville, and the channel included two circuitous parts around Wrights Island and Cedar Bush Marsh.

The original project of 1886 was to dredge a cut 4 feet deep and 100 feet wide through Wrights Island and a second cut 4 feet deep and 150 feet wide through Cedar Bush Marsh. Both were completed, but the Cedar Bush Marsh cut deteriorated at the upper end and was abandoned, and the project of June 18, 1894, to obtain 4 feet depth around Cedar Bush Marsh by dredging and an experimental timber training wall was adopted and successfully carried out. The additional work required is for maintenance.

The act of March 3, 1905, authorized the balance from the project of 1894 to be expended in rebuilding the dike hitherto constructed. (See H. Doc. No. 239, 58th Cong., 2d sess.) This was done, and the dike is now permanent.

The river and harbor act of June 25, 1910, modified the project and authorized the dredging of a channel 200 feet wide and 5 feet deep at mean low water from the mouth of the river to Jacksonville, at an estimated cost of $6,700, with $800 annually for maintenance after completion, in accordance with plan submitted in House Document No. 1085, Sixtieth Congress, second session.

The existing project provides for securing a channel 200 feet wide and 5 feet deep at mean low water from the mouth of the river to Jacksonville.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Channel through bar at inlet	House	[1] 169	Forty-seventh	First	1882 [1]	1117-1119
Do					1885 [1]	1089
Do					1887 [1]	1040
Do					1891 [2]	1380
Do					1893 [2]	1401
Do					1894 [1]	[illegible]
Do	House	[1] 239	Fifty-eighth	Second	1904 [1]	1537-1542
Mouth to Jacksonville	do	[1] 1085	Sixtieth	do		

[1] No maps.

[2] Contains maps.

Amount expended since Civil War on previous projects	$33,807.82
Amount expended on project of 1910 up to June 30, 1912, for improvement	43.71
Total	33,851.53

Received from sales, $0.10.

There was no work done during the year. The expenditures, $43.71, all for improvement, were for office expenses and equipment.

The tidal range at the inlet is about 3½ feet and at the head of the marshes about 1 foot. The head of navigation for all practical purposes is Tar Landing, 8 miles above Jacksonville, 26 miles from the mouth of the river, to which a present depth of 4 feet can be carried. The depth on the bar at the mouth of the river is now 4 feet, but varies from time to time. Above Tar Landing logging and rafting can be carried on for some distance.

The commerce for 1911 amounted to 36,257 short tons, valued at $332,110.50. It consisted principally of timber, fish, fertilizer, cotton seed, and general merchandise.

In its present condition this stream probably has very little effect on freight rates in general, but it affords transportation for products which would otherwise have no means of transportation except by wagon. If the bar and channel were sufficiently improved to justify a line of steam vessels between Wilmington and Jacksonville, freight could probably be carried to the latter point much more cheaply than at present.

It is proposed to apply the existing balance to completion of the project and the appropriation recommended to maintenance. Work has not yet begun under the new project.

July 1, 1911, balance unexpended	$6,561.48
June 30, 1912, amount expended during fiscal year, for works of improvement	43.71
July 1, 1912, balance unexpended	6,517.77
July 1, 1912, outstanding liabilities	100.00
July 1, 1912, balance available	6,417.77
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	500.00
Amount available for fiscal year ending June 30, 1913	6,917.77
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

(*b*) *Waterway between New River and Swansboro, N. C.*—This waterway is a part of the waterway between Beaufort Harbor and New River (see pp. 1124–1127, Annual Report of the Chief of Engineers for 1889), but in 1890 two separate appropriations were made—one for the "Inland waterway between Beaufort Harbor and New River" and the other for the "Waterway between New River and Swansboro," and hence separate reports are made for the two improvements, although one embraces the other.

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[1] See consolidated money statement on page 451.

This waterway is about 22 miles long and originally consisted of tortuous tidal channels winding through the marine marsh, which extends from Swansboro to New River, between the mainland on the one side and the barrier beach or "banks" (which separates it from the ocean) on the other. In the vicinity of the four inlets communicating with the ocean the width of the waterway was several hundred feet and its depth from 12 to 15 feet, while between them its width diminished to about 12 feet in places and its depth to 6 inches at ordinary low water.

The original and existing project, adopted in 1889, is to enlarge the waterway by dredging to a minimum width of 40 feet and minimum depth of 3 to 4 feet at mean high water, at an estimated total cost of $43,000.

Until June 13, 1906, no work except a survey made in April and May, 1901, had ever been done on this waterway, for the reason that an act of the general assembly of North Carolina, ratified February 13, 1889, had incorporated the Wrightsville & Onslow Navigation Co., with the exclusive right to navigate said waterway, as set forth in House Executive Document No. 26, Fifty-second Congress, first session (p. 1147 of the Annual Report of the Chief of Engineers for 1892).

On February 6, 1905, however, a paper was obtained from the two survivors of the four parties named in the charter of said Wrightsville & Onslow Navigation Co., in which paper it was declared that the privileges and franchises granted in said charter had never been exercised and that said privileges and franchises had "to all intents and purposes been surrendered and abandoned."

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entire waterway					1889 [1]	1124-1127
Do					1891 [2]	1377
Do					1891 [2]	1877

[1] No maps.

[2] Contains maps.

The expenditures for the year were $1,331.57, all for improvement, and were in payment for repairs to plant, purchase of new plant, etc., preparatory to starting work.

Amount expended on existing project up to June 30, 1912:

For improvement	$25,688.89
For maintenance	4,800.00
Total	30,488.89

Received from rents, sales, etc., $1,125.

The project is about 65 per cent completed.

The project depth exists throughout the waterway, except at places where shoaling has occurred.

The rise and fall of the tide varies from 2.2 to 4 feet in the neighborhood of the inlets to about 1 foot at the points most distant from the inlets.

The commerce of 1911 amounted to 16,958 short tons, at an approximate value of $275,805.75, an increase of 2,945 tons above that of last year. It consisted principally of cotton, fish, oysters, clams, and fertilizers.

The improvement of this waterway will probably have no direct effect upon freight rates, but if it had sufficient depth it would afford means of transportation for large quantities of timber, lumber, and miscellaneous products that now have no outlet except by wagon or by the smallest draft boats.

It is proposed to apply the available balance and the additional appropriation recommended toward completion of the project and to the maintenance of the present dredged cuts.

July 1, 1911, balance unexpended	$7,798.48
June 30, 1912, amount expended during fiscal year, for works of improvement	1,331.57
July 1, 1912, balance unexpended	6,466.91
July 1, 1912, outstanding liabilities	100.00
July 1, 1912, balance available	6,366.91
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	1,000.00
Amount available for fiscal year ending June 30, 1913	7,366.91
Amount (estimated) required to be appropriated for completion of existing project	[1] 23,798.48
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	([2])

(*c*) *Waterway between Beaufort Harbor and New River* (*i. e., portion between Beaufort and Swansboro*).—Distance from Beaufort to Swansboro, 30 miles, with access at Swansboro to the Atlantic Ocean through Bogue Inlet.

When improvement began in 1886 the governing low-water depth was 18 inches to Swansboro.

The original project is that of 1885, to provide a channel 100 feet wide and 3 feet deep at ordinary low water between Beaufort Harbor and Swansboro, estimated to cost $6,000. This estimate was increased in 1887 to $50,000 and again increased in 1892 to $71,040.

No project was adopted originally for the part beyond Swansboro, but in 1889 a separate project for a channel 40 feet wide by 3 or 4 feet deep over this portion of the waterway was adopted, the estimated cost being $43,000. The act of 1890 made a separate appropriation of $5,000 for this portion of the route, designating it as the "Waterway between New River and Swansboro." (See pp. 1376–1378, Annual Report of the Chief of Engineers for 1891.)

No modification of the original project has been made.

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[1] Exclusive of amount available for fiscal year 1913.

[2] See consolidated money statement on page 451.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entire waterway					1884 [1]	1055–1056
Do					1885 [1]	1138–1139
Do					1891 [2]	1378
Do					1892 [2]	1142
Do					1894 [1]	1084

[1] No maps. [2] Contains maps.

The expenditures for the year were $9,196.17 (of which $918 was for maintenance) and were for redredging Sally Bell Shoal and dredging through Broad Creek, Shell Point, and Sanders Creek Shoals, 101,823 cubic yards of material being removed.

Amount expended on present project to June 30, 1912:	
For improvement	$60,110.73
For maintenance	2,609.54
Total	62,720.27

At the close of the fiscal year 1912 the project depth and width had been obtained through 15,315 linear feet of shoals in the first 16½ miles of the waterway. The project depth is available through the remainder of the waterway, but the cuts are only 40 to 60 feet wide. The project is about 80 per cent completed.

Considerable shoaling has occurred at the western end of Bogue Sound, where deterioration has been greatest.

The tide at Beaufort Inlet, at the eastern end of this waterway, and at Bogue Inlet (the western end of the portion improved under appropriations for waterway between Beaufort Harbor and New River), has a range of about 3½ feet. Where the tides meet in Bogue Sound the range is only about 1 foot.

The commerce for the calendar year 1911 amounted to 55,825 short tons, valued at $956,371, an increase of 22,565 tons above that of last year. The commerce consisted chiefly of lumber, shingles, etc., fish, oysters, clams, rosin, turpentine, miscellaneous farm products, fertilizers, and general merchandise.

It is proposed to use the funds on hand and the appropriation recommended in completing the project and in maintenance.

July 1, 1911, balance unexpended		$11,975.90
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$8,278.17	
For maintenance of improvement	918.00	
		9,196.17
July 1, 1912, balance unexpended		2,779.73
July 1, 1912, outstanding liabilities		1,278.46

July 1, 1912, balance available	$1,506.27
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	6,000.00
Amount available for fiscal year ending June 30, 1913	7,506.27
Amount (estimated) required to be appropriated for completion of existing project	[1] 15,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	([2])

CONSOLIDATED.

July 1, 1911, balance unexpended		$26,335.86
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$9,653.45	
For maintenance of improvement	918.00	
		10,571.45
July 1, 1912, balance unexpended		15,764.41
July 1, 1912, outstanding liabilities		1,473.46
July 1, 1912, balance available		14,290.95
Amount appropriated by river and harbor act approved July 25, 1912		7,500.00
Amount available for fiscal year ending June 30, 1913		21,790.95
Amount (estimated) required to be appropriated for completion of existing project		[1] 38,798.48
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 5,000.00

(See Appendix M 17.)

19. Northeast and Black Rivers, and Cape Fear River above Wilmington, N. C.—(a) Northeast River.—A tributary of Cape Fear River rises in the northern part of Duplin County and flows in a general southerly direction, emptying into the Cape Fear River at Wilmington. Length of river, 130 miles. Section under improvement, from mouth to Kornegays Bridge, 103 miles. Distance from mouth to Bannermans Bridge, 48 miles; to Hallsville, 88 miles; to Kornegays Bridge, the head of navigation, 103 miles.

The original condition before improvement began was as follows: From the mouth, 30 miles up to Rocky Point, the river at low water was from 200 to 300 feet wide, and its channel about 60 feet wide and from 12 to 30 feet deep at high tide. In the next 30 miles the river was 100 to 150 feet wide and 6 to 30 feet deep at low tide. In the next 20 miles there was a depth of from 4.5 to 6 feet at low water. From this point to Hallsville, the river was more narrow, crooked, and shallow. At low stages, it was not navigable for shallow flats.

The original project of 1889 is still in force, and includes the clearing of the natural channel for small steamers to Hallsville, and for pole boats to Kornegays Bridge, at an estimated cost of $30,000.

Additional work proposed is for maintenance only, the project having been completed.

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[1] Exclusive of amount available for fiscal year 1913.

[2] See consolidated money statement on this page.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to source	House	[1] 71	Forty-eighth	Second	1885 [1]	1128-1132
Do	do	[1] 35	Fifty-first	First	1890 [1]	1181-1184
Old county ferry to Juniper Swamp	do	[2] 322	Fifty-third	Third	1895 [1]	1389-1390
Mouth to source	do	[1] 229	Fifty-ninth	First		
From mouth, 2½ miles above	do	[1] 867	Sixty-first	Second		

[1] No maps.

[2] Contains maps.

The expenditures for the year were $1,129.02, all for maintenance.

The work done consisted of snagging between the thirty-eighth and fifty-sixth mileposts, which restored the channel to good condition.

Amount expended on present project up to June 30, 1912:

For improvement	$10,687.96
For maintenance	19,459.39
Total	30,147.35

Received from rent, sales, etc., $243.33.

As a result of the expenditures to date, the channel has been cleared wherever needed. Six feet of water can be carried to Bannermans Bridge and 3 feet to Crooms Bridge during all stages of the water.

From Crooms Bridge to Kornegays Bridge, the head of navigation, the river is so shallow that navigation is practicable only when the water is up. This is liable to occur at any time, but during the summer low stages usually prevail.

The minimum low-water depth to Bannermans Bridge is 6 feet; to Crooms Bridge, 3 feet; to Hallsville, 0.5 foot; to Kornegays Bridge (the head of navigation), 0.1 foot.

There is a tidal range of about 2 feet at the mouth of this stream, which decreases to nothing at or a short distance above Bannermans Bridge. The upper portion is subject to freshets of from 8 to 12 feet.

The channel is at present badly obstructed by snags, etc., above the seventy-ninth milepost, but is in good condition below that point.

The commerce for 1911 amounted to 150,019 short tons, valued at approximately $1,887,574, an increase over last year of 29,974 tons. It consisted principally of timber, fertilizers, general merchandise, cotton, and miscellaneous farm products.

The result of the improvement on freight rates is unknown, but the stream when opened to navigation affords an outlet for farm products, timber, lumber, etc., which have no other outlet except by wagon.

The commerce is handled on a few boats that make some attempt at regular trips, and on a large number of rafts, flats, etc.

The available balance and the additional appropriation recommended will be applied to maintenance.

July 1, 1911, balance unexpended	$2,725.00
Amount transferred to Black River, June 15, 1912	800.00
	1,925.00
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,129.02
July 1, 1912, balance unexpended	795.98
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	3,500.00
Amount available for fiscal year ending June 30, 1913	4,295.98
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

(*b*) *Black River.*—Black River rises in Sampson County, flows in a general southeasterly direction and empties into the Cape Fear River, 14 miles above Wilmington. Length, 175 miles. Section under improvement, mouth to Clear Run, 66 miles. The original condition when improvement began was a natural channel cleared fairly to Point Caswell and roughly to Lisbon, with governing low-water depths of 4 feet to Point Caswell, 2.5 feet to Hawes Narrows, and 1.5 feet to Lisbon.

The original project of 1885 included clearing the natural channel and banks to Lisbon, and the cutting off of a few sharp points at bends. It was amended in May, 1893, by omitting that part of the river above Clear Run, and, as amended, was completed September 20, 1895.

The existing project is that of 1894, to maintain the natural channel to Clear Run, at an estimated cost of $2,000 per annum.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Whole river	Senate	[2] 30	Forty-eighth	First	1883 [1]	1061–1062
Do					1885 [2]	1145–1154

The expenditures during the year amounted to $2,832.30, all for maintenance. The work consisted of snagging operations between the mouth and Clear Run and dredging through a shoal at Hawes Bluff.

Amount expended to June 30, 1912:

On previous project mentioned above	$12,358.40
On present project, for maintenance	18,167.43
Total	30,525.83

Received from rents, sales, etc., $243.34.

The result obtained by the expenditures to date has been a cleared channel, permitting navigation to Point Caswell, 24 miles above the mouth, at all stages, and to Clear Run, 66 miles above the mouth, at stages of 1.5 feet or higher above low water, the governing low-water depths at present being 5 feet to Point Caswell, 2.5 feet to Hawes Narrows, 32 miles above the mouth, and 1.5 feet to Clear Run. There is no steamboat navigation above Clear Run. Lisbon, 74 miles from the mouth, is the head of navigation. The low-water stages prevail usually from May to August, inclusive; during the rest of the year the stage is about 5 to 8 feet higher, but the periods of high and low water are by no means the same every year. No further work, excepting maintenance, is now proposed.

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[1] See consolidated money statement on page 456.

[2] No maps.

The commerce during 1911 amounted to 41,332 short tons; estimated value, $850,991, a decrease from last year of 5,966 tons. It consisted principally of timber, general merchandise, naval stores, fertilizers, cotton, and other farm products.

The commerce is handled on a few boats, which make some attempt at regularity, and on a large number of rafts, flats, etc., whose trips are altogether irregular. Hence it is impossible to get the commercial statistics with even fair accuracy.

The effect of the improvement on freight rates is not known, but the stream when opened for navigation affords an outlet for freight which would have no other outlet except by wagon.

It is proposed to expend the available balance for maintenance of the natural channel up as far as Clear Run, and the appropriation recommended is for further maintenance as required.

July 1, 1911, balance unexpended	$3,049.81
Amount transferred from Northeast River, June 15, 1912	800.00
	3,849.81
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,832.30
July 1, 1912, balance unexpended	1,017.51
July 1, 1912, outstanding liabilities	381.91
July 1, 1912, balance available	635.60
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	3,500.00
Amount available for fiscal year ending June 30, 1913	4,135.60
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

(*c*) *Cape Fear River above Wilmington, N. C.*—The Cape Fear River is formed by the confluence at Haywood, N. C., in Chatham County, of the Deep and Haw Rivers. It flows in a southeasterly direction and empties into the Atlantic Ocean at Cape Fear, near the southern extremity of the State. Its total length is about 400 miles. The improvement of the river is divided into two parts, that section above Wilmington and that section at and below Wilmington. The portion of the section above Wilmington included in the project is from Wilmington to Fayetteville, 115 miles.

The original condition when work began was a channel badly obstructed above Kellys Cove by logs, snags, etc., and with governing low-water depths of 4 feet to Kellys Cove and 1 foot to Fayetteville.

The original project of January 26, 1881, was to clear the river to Fayetteville and obtain a continuous channel by jettying and dredg-

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[1] See consolidated money statement on page 456.

ing, estimated in July, 1893, to cost $275,000 for a channel 4 feet deep to Elizabethtown and 3 feet deep to Fayetteville. It is about 30 per cent completed.

This project has been abandoned, excepting for the maintenance of the natural channel, pending the construction of locks and dams, as authorized by the river and harbor act of June 25, 1910. (See page 456 of this report.)

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Haywood, N. C., to 20 miles below Wilmington.					1872 [1]	742
Wilmington to Fayetteville	House	[1] 78	Forty-sixth	Third	1881 [1]	1018-1020
Above Fayetteville					1884 [1]	1064-1065
Do	House	[2] 65	Fifty-fourth	First	1896 [1]	1144-1147

[1] No maps.

[2] Contains maps.

The expenditures for the year were $2,145.97, all for maintenance. The work consisted of snagging between thirty-eighth and seventy-second mileposts. As the result of operations the channel is free from snags between Wilmington and the thirty-ninth milepost and from the ninety-eighth milepost to Fayetteville. Between the thirty-ninth milepost and ninety-eighth milepost there are still many snags that give trouble during the low stages, or practically the same conditions exist as reported at the end of last fiscal year, on account of the numerous freshets which occurred last winter.

Amount expended on project of 1881 to June 30, 1912:

For improvement	$134, 436. 96
For maintenance	30, 727. 37
Total	165, 164. 33

Received from sales, rents, etc., $414.33.

At present the low-water depths are 8 feet to Kings Bluff, 38 miles above Wilmington; 2½ feet to Elizabethtown, 73 miles above Wilmington; and 2 feet to Fayetteville, 115 miles above Wilmington. Fayetteville is the head of navigation. Low-water stages prevail from two to four months during each summer, and freshets, which raise the water level from 15 to 50 feet at Fayetteville (the effects lower down being less marked), usually occur as often as once a month during the rest of the year. They do not occur with any regularity, however.

The commerce of 1911 was estimated at 197,922 short tons. worth $4,845,390, an increase in the commerce over last year of 35,684 tons.

The effect of the improvement on freight rates is to reduce railroad rates to Fayetteville. To points below Fayetteville the improvement affords an outlet for freight which would have no other outlet except by wagon.

The additional appropriation asked for will be applied to continuing the work of maintenance by snagging and dredging.

July 1, 1911, balance unexpended	$2,145.97
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,145.97
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	5,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	([1])

CONSOLIDATED.

July 1, 1911, balance unexpended	7,920.78
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	6,107.29
July 1, 1912, balance unexpended	1,813.49
July 1, 1912, outstanding liabilities	381.91
July 1, 1912, balance available	1,431.58
Amount appropriated by river and harbor act approved July 25, 1912	12,000.00
Amount available for fiscal year ending June 30, 1913	13,431.58
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2] 12,000.00

(See Appendix M 18.)

20. Cape Fear River above Wilmington, N. C. (locks and dams).—No construction work has yet been done under the existing project to affect navigation conditions. At present the extreme low-water depths are 6.2 feet to Kings Bluff, 39 miles above Wilmington; 2.5 feet to Elizabethtown, 73 miles above Wilmington, and 2 feet to Fayetteville, 115 miles above Wilmington. These depths are not subject to reference to a common plane on account of the slope of the river. The governing width of channel at the extreme low-water depths is 20 feet. Low-water stages prevailed three months during the year, and freshets which raised the water level from 15 to 50 feet at Fayetteville (the effects lower down being less marked) occurred in seven months of the year. The freshets do not occur with any regularity. Steamers made regular trips to Fayetteville eight and one-half months of the year and intermittent trips during the remainder of the year. At the close of the year the river was in good condition for navigation from Wilmington to Fayetteville.

The Cape Fear River rises in the northwestern part of North Carolina and flows in a general southeasterly direction to the Atlantic Ocean, having a length of about 400 miles. The length of the section included in this project is 115 miles from Fayetteville to Wilmington, which is 30 miles from the river's mouth.

A project for slack-water navigation on the Cape Fear River above Wilmington was adopted by the river and harbor act of June 13, 1902, and provided for the construction of three locks and dams, at a cost of $1,350,000, to afford a depth of 8 feet at mean low water. (See H. Doc. No. 180, 56th Cong., 2d sess., or p. 1552 of the Annual

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[1] See consolidated money statement on this page.
[2] Exclusive of amount available for fiscal year 1913.

Report of the Chief of Engineers for 1901.) This act made an appropriation of $50,000 for the purchase of sites for locks and dams. Extensive surveys were made, the sites tentatively located and approved. Abstracts of the titles were made and turned over to the United States district attorney for examination. The titles to the land needed at the lower site were approved and the land purchased, the total expenditure being $14,682.23. The balance of this appropriation ($35,317.77) was later covered into the surplus fund, in accordance with section 10 of the sundry civil act of March 4, 1909.

The river and harbor act of June 25, 1910, adopted a new project for securing a navigable depth of 8 feet up to Fayetteville, in accordance with the report printed in House Document No. 890, Sixtieth Congress, first session, by the construction of two locks and dams, at an estimated cost of $615,000, with $8,000 annually for maintenance. An appropriation of $100,000 was made for beginning the improvement, including surveys and acquisition of land for sites for locks and dams and completion of plans for the same. The said act further provides for the completion of this project by authorizing continuing contracts in the additional sum of $515,000, $315,000 remaining to be appropriated.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Wilmington to Fayetteville	House	[1] 180	Fifty-sixth	Second	1901 [2]	1552
Do	do	[2] 890	Sixtieth	First	1910 [2]	354

[1] Contains maps. [2] No maps.

The expenditures under this project to June 30, 1912, amounted to $42,032.35.

The expenditures during the year were all in connection with execution of approved project and amounted to $30,891.46. Borings were completed at Kings Bluff and Browns Landing. Shoals were surveyed below Kings Bluff. The remainder of the site required for Lock and Dam No. 2 was acquired. Foundation conditions at Kings Bluff were determined precisely by construction of shaft to a depth below the bottom of the lock foundation.

The site at Kings Bluff was cleared and grubbed. Camp buildings for use of construction force were completed and a wharf for landing supplies and materials. The construction of a telephone line from East Arcadia to Kings Bluff was partly completed.

Working plans for Lock and Dam No. 1 at Kings Bluff were completed.

The proportion of the approved project accomplished up to June 30, 1912, is estimated at 7 per cent. No results affecting navigation have been secured by work done. Fayetteville is the head of navigation, 115 miles above Wilmington.

The commerce of 1911 was estimated at 197,922 short tons, valued at $4,845,390, an increase over last year of 35,684 short tons.

The most important items of this commerce are general merchandise, fertilizer materials, and fertilizers.

The amount estimated for the year 1914 will be applied to continuing work in connection with the new project.

July 1, 1911, balance unexpended	$288,859.11
June 30, 1912, amount expended during fiscal year, for works of improvement	30,891.46
July 1, 1912, balance unexpended	257,967.65
July 1, 1912, outstanding liabilities	2,271.78
July 1, 1912, balance available	255,695.87
Amount of continuing contract authorization, act of June 25, 1910	515,000.00
Amount appropriated under such authorization	200,000.00
Amount yet to be appropriated	315,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 315,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 315,000.00

(See Appendix M 19.)

21. Cape Fear River, N. C., at and below Wilmington.—For description of river see Cape Fear River, N. C. Above Wilmington, p. 454 and 456 of this report.

The condition of the river prior to the opening of New Inlet (which seems to have occurred during an equinoctial storm in 1761) is rather uncertain, but old maps indicate that there was a low-water depth of 14 feet across the bar at the mouth, the least depth between Wilmington and the mouth being 7.5 feet. There is also some uncertainty as to the conditions in 1829, when the improvement was first undertaken by the United States, but the most reliable information is that there was then about 7 to 7.5 feet at low water in the river, about 9 feet in Baldhead Channel, 9 feet in the Rip Channel, and 10 feet at New Inlet. Work on the bar was first begun in 1853, at which time the bar depths at low water were 7.5 feet in Baldhead Channel, 7 feet in Rip Channel, and 8 feet at New Inlet, the governing low-water depths in the river having been increased to 9 feet.

The original project of 1827 was to deepen by jetties the channel through the shoals in the 8 miles next below Wilmington. This project resulted in a gain of 2 feet available depth. The project of 1853 was to straighten and deepen the bar channel by dredging, jettying, diverting flow from the New Inlet, and closing breaches in Zekes Island. This project was incomplete when the Civil War began.

Expenditures prior to Civil War (including balance transferred), $363,228.92.

After the Civil War the first project was that of 1870, to deepen the bar channel by closing breaches between Smiths and Zekes Islands, with the ultimate closure of New Inlet in view. The project of 1873 included that of 1870, and in addition the dredging of the bar channel and closing of New Inlet. The project of 1874 was to obtain by dredging a channel 100 feet wide and 12 feet deep at low water up to Wilmington. The project of 1881 was to obtain by dredging a channel 270 feet wide and 16 feet deep at low water up to Wilmington. These projects had been practically completed in 1889.

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[1] Exclusive of the balance unexpended July 1, 1912.

Expenditures since Civil War on prior projects, $2,102,271.93.

The project adopted September 19, 1890 (see Annual Report of the Chief of Engineers for 1889, p. 1132), was to obtain a mean low-water depth of 20 feet and a width of 270 feet from Wilmington to the ocean, at an estimated cost of $1,800,000. This project was modified by act of June 13, 1902, to authorize the construction of mooring dolphins at Wilmington at a cost of $30,000, and to provide for the removal of obstructions at mouth of Brunswick River, at an estimated cost of $1,000 (see H. Doc. No. 180, 56th Cong., 2d sess.). The project was modified by the river and harbor act of March 2, 1907, which provides for continuing improvement in accordance with report submitted in House Document No. 545, Fifty-ninth Congress, first session, for completion of the 20-foot project to the projected width, by dredging and the excavation of a mooring basin in lieu of constructing mooring dolphins at Wilmington, involving a reduction in the estimate of cost to $1,392,750, including removal of obstructions at mouth of Brunswick River. The act also authorized improvement to such depth in excess of 20 feet as appropriations for the work may permit, due regard being given to the difference in tidal oscillation at the upper and lower portions of the improvement, and authorizes so much as may be necessary of the funds available to be applied to repairing the New Inlet and Swash Defense Dams. The cost of these repairs is estimated at $165,000. Annual maintenance is estimated to cost $65,000.

As the depth of this river is increased under the indefinite project, however, the annual cost of maintenance will increase.

The river and harbor act of March 2, 1907, appropriated the sum of $165,000 for improvement and authorized an additional expenditure of $250,000, all of which has since been appropriated, and the river and harbor act of March 3, 1909, provided an additional appropriation of $300,000 for this improvement.

The river and harbor act of June 25, 1910, authorized the expenditure of an additional $400,000 in securing such depth in excess of 20 feet as the appropriation may permit, and provided that if, in the judgment of the Secretary of War, the prices received in response to advertisement for bids for dredging are not reasonable and less than those at which the Government can perform the same work, so much of the amount appropriated by the said act as shall be necessary may be expended for the purchase or construction of a suitable hydraulic dredging plant for use on the Cape Fear River.

Suitable bids having been obtained, $200,000 of the above was pledged by contract.

The river and harbor act of February 27, 1911, made an appropriation of $100,000 for continuing the improvement to such depth in excess of 20 feet as appropriations made for the work will permit, and provided also that not exceeding $1,000 thereof may be used for clearing to a depth of 10 feet the channel or cut between the main channel of the river and the Carolina Beach Pier. This latter work was completed in May, 1911, which resulted in a channel 10 feet deep, 80 feet wide, and about 700 feet long.

The river and harbor act of July 25, 1912, modified the project so as to secure an available channel depth of 26 feet at mean low water and width of 300 feet, increased at entrance and curves in the river and widening to 400 feet across the bar, at an estimated cost of $572,940, with $80,000 annually for maintenance, in accordance with report printed in House Document No. 287, Sixty-second Congress, second session.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Wilmington to mouth	House	[1] 127	Twentieth	First		
Do					1873 [1]	44
Mouth of river	Senate	[1] 27	Forty-first	Third		
Do	House	[1] 108	Forty-second	do		
Wilmington to mouth	Senate	[1] 58	Forty-fifth	Second		
Do					1889 [1]	1132–1134
Wilmington Harbor and Wilmington to Fayetteville	House	[1] 180	Fifty-sixth	Second	1901 [1]	1552–1559
Wilmington to mouth	do	[1] 545	Fifty-ninth	First		
Do	do	[2] 287	Sixty-second	Second		

[1] No maps.

[2] Contains maps.

The existing project is that of 1890, modified in 1902 and 1907, by authorizing the excavation of a mooring basin at Wilmington, and the repair of New Inlet and Swash Defense Dams, again modified in 1912, to secure a channel depth of 26 feet, and width of 300 feet in the river, and width of 400 feet across the bar.

The expenditures during the year were $289,279.98, of which $75,000 was for maintenance. The work consisted of dredging under contract and with Government plant, making repairs to New Inlet Dam and its extension at Federal Point; making minor surveys and repairs to plant. The following quantities of material were removed: 661,762 cubic yards from ocean bar, 3,240,388 cubic yards from river channels, and 7,525 cubic yards from Carolina Beach cut.

As the result of the year's work, a channel 26 feet deep has been obtained across the ocean bar, varying in widths from 250 to 300 feet. In the river, a channel 26 feet deep to Reaves Point and 28 feet deep on up to Wilmington, was completed to a width of 150 feet, except the lower reach of Snows Marsh Channel, where the 26-foot channel is 270 feet wide, and at the Keg Island Shoal, where the width of the 28-foot channel was only 74 feet for a length of 2,000 feet. Carolina Beach cut was also restored to its former width of 80 feet and depth of 10 feet. The repairs to New Inlet Dam and Federal Point extension were completed, and this and Swash Defense Dam and their extensions are in good condition.

EXPENDITURES.

On existing project up to June 30, 1912:	
For improvement	$2,074,271.57
For maintenance	694,957.72
Total	2,769,229.29

Received from rent, sales, etc., $36,730.02.

The average rise of the tides is 4½ feet at the ocean bar, 3½ feet at Keg Island, and 2½ feet at Wilmington.

The distance from the ocean bar to Wilmington is 30 miles, and the river is navigable 115 miles farther up to Fayetteville, the head of navigation.

The commerce of the year 1911 amounted to 1,063,908 short tons, valued at $58,933,962, an increase over last year of 119,251 tons.

The commerce consisted principally of cotton, cottonseed meal, naval stores, manufactured lumber, shingles, fertilizers, fertilizer material, coal, gum logs, crossties, and general merchandise.

As a result of the improvement, vessels coming to Wilmington are much larger than formerly, the average tonnage in 1886 being 421, while in 1911 the average was 1,259. This increase in tonnage has caused a corresponding decrease in freight rates on shipments by water.

The available balance and additional appropriation recommended will be applied to completing the improvement of the modified 1912 project and to maintaining the dredged channels.

July 1, 1911, balance unexpended		$316,538.30
Amount received from sales		2,970.48
		319,508.78
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$214,279.98	
For maintenance of improvement	75,000.00	
		289,279.98
July 1, 1912, balance unexpended		30,228.80
July 1, 1912, outstanding liabilities		9,312.45
July 1, 1912, balance available		20,916.35
Amount appropriated by river and harbor act approved July 25, 1912		300,000.00
Amount available for fiscal year ending June 30, 1913		320,916.35
Amount (estimated) required to be appropriated for completion of existing project		[1] 352,940.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[1] 352,940.00

(See Appendix M 20.)

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

Reports on preliminary examinations and surveys required by the river and harbor act of March 3, 1909, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. *Preliminary examination and survey of Pamlico and Tar Rivers with a view to obtaining a greater depth and width as far up as*

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[1] Exclusive of amount available for fiscal year 1913.

Tarboro, N. C.—Reports dated May 27, 1909, and December 6, 1910, with map, are printed in House Document No. 270, Sixty-second Congress, second session. A plan for improvement at an estimated cost of $94,050 for first construction, and $3,500 annually for maintenance, is presented.

2. *Preliminary examination and survey of Cape Fear River at and below Wilmington, N. C., with a view to obtaining a suitable depth and width.*—Reports dated August 5, 1909, and January 31, 1911, with maps, are printed in House Document No. 287, Sixty-second Congress, second session. A plan for improvement at an estimated cost of $572,940 for first construction and $80,000 annually for maintenance, subject to the condition that local authorities will expend the sum of $200,000 for terminal improvements, is presented.

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and surveys required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. *Preliminary examination of Fishing Creek, N. C.*—Report dated March 27, 1911, is printed in House Document No. 356, Sixty-second Congress, second session. The improvement of this stream is not considered worthy of being undertaken by the General Government at the present time.

2. *Preliminary examinations of Cape Lookout, N. C., with a view to determining its relative advantage and value as a site for a harbor of refuge, and its availability and adaptability as a commercial harbor.*—Reports dated December 12, 1910, are printed in House Document No. 528, Sixty-second Congress, second session. The construction of a harbor by the General Government at Cape Lookout for commercial purposes alone is not considered warranted; but a plan for a harbor of refuge at this locality, at an estimated cost of $3,526,600 for first construction, is presented.

3. *Preliminary examination of channel from Core Sound to Newport River, N. C., by way of Taylors Creek or Carrot Island Slough.*—Reports dated December 19, 1910, and April 28, 1911, with map, are printed in House Document No. 546, Sixty-second Congress, second session. A plan for improvement at an estimated cost of $30,000 for first construction, with $2,000 annually for maintenance, subject to local cooperation to the extent of one-third ($10,000) of the estimated cost of the improvement.

4. *Preliminary examination and survey of Shallotte River, N. C.*—Reports dated January 19, 1911, and January 17, 1912, are printed in House Document No. 721, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $9,845 for first construction, with $1,000 annually for maintenance, is presented, with the further statement that further improvement to 6-feet depth is desirable also, provided the extra first cost be provided for by local interests.

EXAMINATION MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Report dated June 22, 1911, on preliminary examination of *Swift Creek, Craven County, N. C.*, with a view to dredging a channel through Horseshoe Bend and Poplar Branch, required by the river and harbor act approved February 27, 1911, was duly submitted by the district officer. It was reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and was transmitted to Congress and printed in House Document No. 279, Sixty-second Congress, second session. The improvement of this locality in the manner proposed is not deemed worthy of being undertaken by the General Government at the present time.

The local officer was also charged with the duty of making other preliminary examinations and surveys, provided for by the river and harbor acts approved June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received.

1. *Core Creek, N. C.*, with a view to the improvement of navigation up to Core Creek Landing.
2. *Scuppernong River to the town of Cherry, N. C.*
3. *Harbor of Belhaven, N. C., and entrance thereto.*
4. *Slades Creek, N. C.*
5. *Elizabeth River, N. C.*
6. *Pamlico River, N. C.*, with a view to improving the inner channel on the north side of that river, and with a further view of removing any excavated material which may have heretofore been placed therein by the War Department, beginning at the mouth of Runyons Creek, on the north side of said river, below Washington, N. C., and extending eastwardly down said river as far as may be necessary.
7. *Northeast Cape Fear River, N. C.*, from its mouth to Hallsville.
8. *Deep Creek, N. C.*, from its mouth on Albemarle Sound to the head of navigation.
9. *South River, N. C.*, with a view to obtaining increased depth above Aurora.

IMPROVEMENTS OF RIVERS AND HARBORS IN THE CHARLESTON, S. C., DISTRICT.

This district was in the charge of Col. Dan C. Kingman, Corps of Engineers, until July 28, 1911; and in charge of Maj. G. P. Howell, Corps of Engineers, since that time. Division engineer, Col. Dan C. Kingman, Corps of Engineers.

1. *Waccamaw River, N. C. and S. C.*—This stream rises in Lake Waccamaw, Columbus County, N. C., and flowing in a general southwesterly direction empties into Winyah Bay, at Georgetown, S. C. Its length is 147 miles, all of which is embraced in the project.

In 1880 this stream was navigable for 12-foot draft boats at all stages of water from Georgetown, 23 miles, to Bull Creek, and at high water 4 miles farther, to Bucks lower mills (Bucksport); thence for 7-foot draft boats at high water, 22 miles farther, to Conway;

thence it possessed an obstructed channel for 3-foot draft boats, at ordinary winter water, 68 miles, to Reeves Ferry; thence an obstructed channel, with 3 feet at high water, for 30 miles, to Lake Waccamaw.

The project of improvement, adopted in 1880, provides for a channel 12 feet deep at all stages of water, with 80 feet bottom width from the mouth of the river to Conway, thence a cleared channel to Lake Waccamaw.

The original estimated cost was $29,370, which was revised in 1885 and increased in the annual report of that year to the present figure, $138,400. In the Annual Report of the Chief of Engineers for 1886, page 170, maintenance is estimated at $4,000 per year after completion of improvement.

For report on examination of the river upon which the project is based see Senate Executive Document No. 104, Forty-sixth Congress, second session, (p. 848, Annual Report of the Chief of Engineers for 1880). The document does not contain a map of the river. For outline map of the river see page 1200, Annual Report of the Chief of Engineers for 1889.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Conway to Lake Waccamaw [1]					1884	1056
Mouth to Conway [2]	House	514	Fifty-eighth	Second	1904	1614

[1] No maps.

[2] Contains maps.

No modification has been made in the existing project since its adoption.

During the year dredging was carried on below Conway to obtain an 8-foot channel. The work of making the necessary cut-offs was completed. The number of cubic yards removed was 112,512 and the expenditure was $17,857.69, $2,000 of which was for maintenance.

The total amount expended on the existing project up to June 30, 1912, was $196,599.97, of which $52,358.53 was for maintenance. The receipts from miscellaneous sources have been $302.50.

The proportion of the approved project accomplished to June 30, 1912, is 60 per cent. All the cut-offs required below Conway have been made and deepened to 8 feet, with width of 80 feet. There is a 12-foot channel at mean low water to Bucksport, 27 miles above the mouth; 6 feet to Conway, 50 miles; about 2 feet to Worthams Bridge, 97 miles. At high water boats of good size go to Red Bluff, 74 miles, and small boats to Reeves Ferry, 117 miles. This is the head of navigation. The usual variation in water surface is about 7.5 feet at Conway and about 12 feet at Star Bluff, 84 miles above the mouth. The tidal influence at low water extends 97 miles above the mouth.

During the calendar year 1911 the commerce carried on the river was 107,811 tons, valued at $1,621,653. The principal articles were cotton, cotton goods, timber and its products, provisions, etc. There has been little change in the nature of the commerce.

Railroad rates to and from Conway are lower on a good proportion of the articles of traffic than to and from several interior towns en route to Conway and, as the river touches points not reached by railroads, the improvement enables freight to be taken to such points.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to forming the 12-foot channel to Conway. The additional work proposed is necessary for the purpose of extension of benefits.

July 1, 1911, balance unexpended		$19,260.22
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$15,857.69	
For maintenance of improvement	2,000.00	
		17,857.69
July 1, 1912, balance unexpended		1,402.53
July 1, 1912, outstanding liabilities		1,402.53
Amount appropriated by river and harbor act approved July 25, 1912		25,000.00
Amount available for fiscal year ending June 30, 1913		26,402.53
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 30,000.00

(See Appendix N 1.)

2. *Little Peedee River, S. C.*—This river rises in Richmond County, N. C., and, flowing in a southerly direction, empties into the Great Peedee River at a point 34 miles above the mouth of the latter in Winyah Bay at Georgetown, S. C. Its length is about 220 miles, but only the lower 113 miles are embraced in the project.

The river in its original condition was much obstructed by snags and overhanging trees and by 10 bridges without draws. In places it was divided into several branches, in none of which was there a good channel.

Under the plan of improvement adopted in 1888 it is proposed to snag the river and close unnecessary branches, providing for steamboat navigation up to the mouth of Lumber River, 65 miles, and for pole-boat navigation 48 miles farther, to Little Rock, at an estimated cost of $50,000.

For report on examination of the river upon which the project is based see page 1111, Annual Report of the Chief of Engineers for 1887. The report does not contain a map of the river. For outline map of the river see page 1214, Annual Report of the Chief of Engineers for 1890. For report on preliminary examination of the river from its mouth to the mouth of Lumber River see House Document No. 862, Sixty-first Congress, second session. (No map.)

No modification has been made in the existing project since its adoption.

The operations during the year consisted in snagging the lower 21 miles of the river. The expenditure was $4,382.03, all of which was for maintenance.

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[1] Exclusive of amount available for fiscal year 1913.

The total amount expended on the existing project up to June 30, 1912, was $34,357.52, of which $14,807.53 was for maintenance. The receipts from miscellaneous sources have been $110.40.

As snagging will be required continually, the approved project will never be completed. The river had been well snagged to Lumber River and roughly cleared for pole-boat navigation to Little Rock. At present the river is well snagged from the mouth to Hughes Landing, 21 miles. Steamer traffic on the river is limited to the flush-water season, which generally lasts eight months, during which time the river can be navigated by craft drawing 2½ feet. No navigation can be carried on during low water. The usual variation in water level at Gilchrist Bridge, 65.5 miles above the mouth, is about 9.5 feet. The plane of reference is ordinary low water. The head of navigation for some years has been Gallivants Bridge, 47 miles above the mouth.

The commerce during the calendar year 1911 amounted to 1,321.5 short tons, valued at $56,460, of which 151.5 tons, valued at $36,360, was cotton, and 440 tons, valued at $11,000, was fertilizers. There was little change in the nature of the commerce during the year.

This improvement enables farmers to import fertilizers and supplies at a cost less than railroad rates, plus cost of hauling. Some of the territory to the westward of the river has lately been provided with railroad facilities where none existed formerly. Water rates were reduced 25 cents per ton on fertilizer and 25 cents per bale on cotton, to meet railroad rates.

July 1, 1911, balance unexpended	$16, 834. 51
Receipts on account of sales	. 40
	16, 834. 91
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	4, 382. 03
July 1, 1912, balance unexpended	12, 452. 88
July 1, 1912, outstanding liabilities	429. 53
July 1, 1912, balance available	12, 023. 35
July 1, 1912, amount covered by uncompleted contracts	50. 00

(See Appendix N 2.)

3. Great Peedee River, S. C.—This river is a continuation of the stream called the Yadkin River, which rises in the mountains in the northwestern part of North Carolina, and flows in a southeasterly direction across the State. It changes its name to the Peedee (or Great Peedee) at the mouth of the Uwharie River in North Carolina, at a point 67 miles above Cheraw, S. C. Its length from this point to its mouth in Winyah Bay at Georgetown, S. C., is 234 miles, of which the portion below Cheraw, 167 miles, is embraced in the project.

The river in its original condition was dangerously obstructed by logs everywhere. Boats drawing 9 feet of water were able to reach Smiths Mills, 52 miles above the mouth. Those drawing 3½ feet could get 54 miles farther up at low water to Little Bluff, or at high water to Cheraw, 167 miles from the mouth.

The project of improvement adopted in 1880 provides for a thoroughly cleared 9-foot navigation to Smiths Mills and a 3½-foot navigation to Cheraw at all stages of water.

The original project contained no estimate of cost. From 1880 to 1886, inclusive, $47,000 was appropriated. In the Annual Report of the Chief of Engineers for 1886, page 170, it was estimated that $70,000 in addition to this $47,000 would complete the improvement, and that $5,000 a year would be required for maintenance.

A project for the improvement of the upper river (the 64 miles between Cheraw and the bridge of the Wilmington, Columbia & Augusta Railroad) was adopted in 1902. This project was in accordance with the original project and provided for obtaining, by snagging and dredging, a cleared channel, with a least depth of 3½ feet at mean low water, at a cost of $118,300. This total amount has been appropriated, and the work completed.

For report on examination of the river upon which the project is based, see Senate Executive Document No. 117, Forty-sixth Congress, second session (p. 845, Annual Report Chief of Engineers for 1880). This document does not contain a map of the river. For outline map of river, see page 1180, Annual Report Chief of Engineers for 1889.

Reference to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Cheraw and Wilmington, Columbia & Augusta R. R. bridge.[1]	House	124	Fifty-sixth	Second	1901	1607
Georgetown and Pedee Station[1]	do	1162	Sixtieth	do		
Cheraw to Blewetts Falls, N. C.[1]	do	305	Sixty-first	do		
Georgetown to Cheraw[1]	do	308	do	do		
Gibson Dam, S. C.[1]	do	23	Sixty-second	do		

[1] No maps.

No modification has been made in the existing project since its adoption.

During the year the work accomplished was the snagging of the river between mile 87 and Bull Creek. The expenditure was $11,863.06, all of which was for maintenance.

The total amount expended on existing project up to June 30, 1912, was $290,599.31, of which $106,886.90 was for maintenance. The receipts from miscellaneous sources have been $263.28.

As snagging will continually be required, the approved project will never be completed. The river had been cleared of snags from the mouth to the Wilmington, Columbia & Augusta Railroad bridge, 103 miles, and between that bridge and Cheraw, 167 miles, a 3½-foot channel had been formed; but, as there has been no navigation lately above mile 87, the upper portion of the river is blocked again. The usual variation in water level is 16.4 feet at Smiths Mills, 52 miles above the mouth, and 34.2 feet at Cheraw. The plane of reference is ordinary low water. About 9 feet can be carried to Smiths Mills and about 3 feet to Birches Ferry, 87 miles, the present head of navigation.

The commerce carried during the calendar year 1911 amounted to 31,396 tons, valued at $1,062,415. It consisted of cotton, fertilizers, timber and its products, provisions, etc. There was little change in the nature of the commerce during the year.

This improvement enables steamers to carry freights to points which can not be reached by rail. The rates have lately been advanced from 50 to 75 cents per bale on cotton and from $1.25 to $1.50 per ton on fertilizers owing to increased operating expenses. Package rates remain the same.

The amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied to snagging the river wherever necessary for navigation. The additional work proposed is necessary to make the improvement available.

July 1, 1911, balance unexpended	$26,824.96
Receipts account sales during the year	2.07
	26,827.03
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	11,863.06
July 1, 1912, balance unexpended	14,963.97
July 1, 1912, outstanding liabilities	2,557.24
July 1, 1912, balance available	12,406.73
Amount appropriated by river and harbor act approved July 25, 1912	10,000.00
Amount available for fiscal year ending June 30, 1913	22,406.73
July 1, 1912, amount covered by uncompleted contracts	25.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]15,000.00

(See Appendix N 3.)

4. Winyah Bay, S. C.—Winyah Bay lies on the coast of South Carolina, 50 miles northeast of Charleston Harbor. Its length from the ocean bar to the entrance to the city of Georgetown in a northerly direction is about 13 miles. Its breadth is small, being generally about 1½ miles, though at one place it enlarges to an area of 3 miles long and 4 miles wide. Its area is about 25 square miles.

This large bay is connected with the ocean by a passage between the shores of North and South Islands 2½ miles long, 1 mile wide at the bay, three-fourths mile wide at the gorge, and 1¼ miles wide at the ocean, or southeasterly, end of North Island. Through the passage, which trends north-northwest and south-southeast, there is a bold channel 36 feet deep at the bay, retaining a depth of not less than 20 feet until about 3,000 feet southerly from the end of North Island and of not less than 15 feet to a point about 1 mile south of the island, where the channel divides into two. One of these two channels, known as Main Channel, continues 3¼ miles farther, through extensive shoals, to the 18-foot contour in the ocean. This channel is south-southeast and in alignment with the main channel through the straits. The other, known as Bottle Channel, after flowing about 2,500 feet southeasterly, 1,500 feet easterly, and about 3,000 feet northeasterly, reaches the 18-foot contour in the ocean at a distance of about 1½ miles in a direction from the point of separation from the main ship channel almost at right angles with the direction of that channel and of the channel through the passage. At mean low water the depth on the crest of the bar is variable in both channels and about 7 to 9 feet in Main Channel and 6 to 8 feet in Bottle Channel. The mean range of tide is 3½ feet.

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[1] Exclusive of amount available for fiscal year 1913.

The former project, adopted in 1889, provided for the construction of two jetties springing, respectively, from North and South Islands and converging toward the bar, the jetties to consist of mattress foundation and a superstructure of large riprap stone raised to a height of 6 feet above mean low water, the south jetty to extend due east across the bar and the north jetty to converge toward it, so as to produce the necessary contraction on the bar. The depth to be secured was 15 feet at mean low water. The river and harbor act of June 3, 1896, authorized the completion of the work under the continuing-contract system, at a cost not exceeding $1,996,250, in addition to the $20,000 appropriated by the act. The entire amount has been appropriated by sundry civil acts since that date, and the jetties were completed in November, 1902. The project was extended by the river and harbor act approved June 13, 1902, to permit dredging at the shoal places in Winyah Bay, between the entrance and the city of Georgetown, S. C., over which the least channel depths might at any time be less than at the entrance to the bay, provided that the expenses of this dredging, added to that of improving the entrance to the bay, should not exceed the total amount authorized under the continuing-contract system. This 15-foot project was completed June 30, 1909.

The existing project as adopted in the river and harbor act of June 25, 1910, provides for securing a channel 18 feet deep from a point on the Sampit River 1 mile above the limits of the city of Georgetown, S. C., to the ocean entrance of Winyah Bay, following the western shore of the bay as far as may be necessary, at an estimated cost of $650,000.

For reports on examination of the harbor upon which the original project was based see page 1154, Annual Report of the Chief of Engineers for 1885 (printed with maps) and House Document No. 117, Fiftieth Congress, second session (p. 1110, Annual Report Chief of Engineers for 1889), printed with map. For report on examination upon which the present project is based, see House Document No. 398, Fifty-eighth Congress, second session, printed with map (p. 1591, Annual Report Chief of Engineers, 1904).

Reference to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Bar to mouth	Senate	[1] 46	Forty-seventh	First	1882	1122
Sampit River	House	[2] 387	Fifty-sixth	Second	1900	1883
Basin Winyah Bay	do	[1] 278	Sixty-second	do		

[1] No maps.

[2] Contains maps.

The existing project provides for a channel 18 feet deep and 400 feet wide from a point on the Sampit River 1 mile above the limits of the city of Georgetown, S. C., to the ocean entrance of Winyah Bay, following the western shore of the bay as far seaward as may be necessary, at an estimated cost of $650,000.

During the fiscal year 1912, dredging was done in the eastern channel of Winyah Bay and at the entrance to Sampit River to maintain the 15-foot channel, and repairs were made to the mud dike on South Island. These expenditures—$15,991.67—were for maintenance. A beginning was made in forming the new 18-foot channel along the western shore of Winyah Bay by dredging a distance of 22,670 feet, to a width of 280 feet, the expenditures being $138,794.67.

The total amount expended on the former 15-foot project up to June 30, 1912, was $2,522,310.52, of which $123,958.64 was for maintenance; of this amount $8,197.28 was derived from miscellaneous sources. The total amount expended on the new 18-foot project was $151,280.74, none of which was for maintenance.

This work has been in progress under continuing contract appropriation of $100,000, under authority of the river and harbor act of February 27, 1911, which amount was appropriated by the sundry civil act of August 24, 1912.

The proportion of the approved project accomplished up to June 30, 1912, is 30 per cent. A channel has been dredged to the depth of 18 feet along the western shore of Winyah Bay for a length of 22,670 feet. The controlling depth June 30, 1912, is 14 feet, and the maximum draft that can be carried over the shoalest part of the locality under improvement is 17 feet. The mean tidal variation is 3½ feet. The distance between the limits named in the project for the authorized channel is about 14 miles.

The amount of the commerce for the calendar year 1911 was 314,503 tons, valued at $5,322,569. It consisted mainly of lumber, timber products, cotton, provisions, and general merchandise. There has been little change in the nature of the commerce during the past year.

This improvement and the operation of ocean-going steamers and sailing vessels appear to secure to Georgetown the usual port differentials which are designed to meet water competition, this particularly on through freight from and to New York and Baltimore. The precise percentage of reduction of rates does not appear to be susceptible of determination.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to forming the 18-foot channel in front of the city of Georgetown, and in the western channel. The additional work proposed is for the purpose of extension of benefits.

July 1, 1911, balance unexpended		$139,360.13
Allotted from emergency appropriations, acts of 1907 and 1909		15,991.67
Receipts on account of sales		32.23
		155,384.03
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$138,794.67	
For maintenance of improvement	15,991.67	
		154,786.34

July 1, 1912, balance unexpended	$597.69
July 1, 1912, outstanding liabilities	375.77
July 1, 1912, balance available	221.92
Amount appropriated by river and harbor act approved July 25, 1912	162,000.00
Amount appropriated by sundry civil act approved Aug. 24, 1912	100,000.00
Amount available for fiscal year ending June 30, 1913	262,221.92
July 1, 1912, amount covered by uncompleted contracts	72,072.06
Amount of continuing contract authorization, act of Feb. 27, 1911	100,000.00
Amount appropriated under such authorization	100,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 250,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 65,000.00

(See Appendix N 4.)

5. *Mingo Creek, S. C.*—Mingo Creek is a river about 45 miles long, lying in Williamsburg and Georgetown Counties, S. C. It rises at a point 12 miles east of Kingville, S. C., flows in a southeasterly direction, and empties into Black River at a point about 25 miles above the mouth of the latter and about 30 miles (by water) from Georgetown, S. C. The head of navigation is regarded as being 31 miles above the mouth, and this is the section included in the project.

From the mouth of the Mingo downward to Winyah Bay there is a good navigable channel. Above the mouth the river was obstructed by snags and overhanging trees. As far as Rhems Landing (7 miles above the mouth) the channel was 10 feet deep; to Hemmingway Bridge, 4 miles farther, the channel was 7 feet deep; to Williams Landing, 10 miles farther, the channel was 5 feet deep at low water. Beyond to the head of navigation, 10 miles farther, the channel was 4 to 5 feet deep at high water.

The former project, adopted in 1888, provided for improving the stream for steamboats from its mouth to Williams Landing and for pole boats at high water to the head of navigation, by snagging and clearing banks, at an estimated cost of $17,000. The amount expended on this project up to June 30, 1912, was $17,665.14, $665.14 of which was for maintenance.

The existing project, adopted by the river and harbor act approved July 25, 1912, provides for an unobstructed 8-foot low-water channel, with bottom width of 60 feet from the mouth of Hemmingway Bridge, 11 miles, at an estimated cost of $22,000, with $1,000 annually for maintenance, and was adopted subject to the condition that the necessary right of way for cut-offs is furnished free of cost to the United States, as recommended in House Document No. 782, Sixty-first Congress, second session.

For report on examination of the stream upon which the original project was based, see page 1106, Annual Report Chief of Engineers for 1887 (printed without map). For report on examination and survey of the stream from Hemmingway Bridge to the mouth, upon which present project is based, see House Document No. 782, Sixty-first Congress, second session (printed without map).

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[1] Exclusive of amount available for fiscal year 1913.

There was no work during the year. The expenditure of $65.14 reported was for inspection and office expenses.

No expenditure has been made on the existing project.

No work has been done on the approved project.

With the funds appropriated the project will be completed.

At mean low water 8 feet can be carried to Hemmingway Bridge, a distance of 11 miles, the head of navigation. Tidal influence extends this far.

The commerce during the calendar year 1911 amounted to 45,721 tons, valued at $1,038,707. It consisted of cotton, fertilizer, timber and its products, provisions, etc. During the year the commerce increased about 33⅓ per cent.

The improvement enables steamers to carry freight to points that can not be reached by rail. The only change in water rates is an advance from 10 cents to 25 cents in the minimum package rate.

July 1, 1911, balance unexpended	$2,000.00
June 30, 1912, amount expended during fiscal year, for works of improvement	65.14
July 1, 1912, balance unexpended	1,934.86
July 1, 1912, outstanding liabilities	1,448.13
July 1, 1912, balance available	486.73
Amount appropriated by river and harbor act approved July 25, 1912	22,000.00
Amount available for fiscal year ending June 30, 1913	22,486.73

(See Appendix N 5.)

6. Santee, Wateree, and Congaree Rivers, and Estherville-Minim Creek Canal, S. C.—*(a) Santee River and Estherville-Minim Creek Canal.*—This river is formed by the confluence of the Congaree and Wateree Rivers, at a point 30 miles southeast of Columbia, S. C. It flows in a southeasterly direction for a distance of 143 miles and empties into the Atlantic Ocean a few miles west of the entrance to Winyah Bay. The entire length is embraced in the project.

This river in its original condition was considerably obstructed at all stages of water by sunken logs and snags. Its bar entrance was narrow, crooked, and shifting, with only about 4 feet of water at low tide, and so situated as to be difficult and expensive to improve.

The original project, adopted in 1880, contemplated providing an outlet for the river into Winyah Bay by constructing a canal from the river through Mosquito Creek into the bay. On this project there was expended $99,750.

The present project, adopted in 1889, contemplates providing a more satisfactory outlet into the bay by cutting a canal 70 feet wide and 6 feet deep at mean low water from the Estherville plantation to Minim Creek and for snagging the entire river. The estimated cost is $350,000, not including the amount expended under the original project.

For reports on examination of the river upon which the projects were based see Senate Document No. 161, Forty-sixth Congress, second session (p. 916, Annual Report, Chief of Engineers, 1880), printed without map; and page 1184, Annual Report, Chief of Engineers, for 1889, printed with maps, showing also the outline of the river. For report on preliminary examination of river and canal see House Document No. 608, Sixty-first Congress, second session, printed without map.

The existing project provides for snagging the entire river and for cutting a canal 70 feet wide and 6 feet deep at mean low water from Winyah Bay to the Santee River at Minim Creek.

The operations during the year were confined to redredging the Estherville-Minim Creek Canal and to removing obstructions from same. The expenditure was $10,486.51, all of which was for maintenance.

The total amount expended on the existing project up to June 30, 1912, was $260,120.38, of which $75,584.84 was for maintenance. The receipts from miscellaneous sources have been $234.32.

Since continual work will be required to maintain the canal and snag the river, the approved project will never be completed. The maximum draft that can be carried is about 5 feet through the canal and 3 feet in the river. The plane of reference is for the canal and lower river mean low water, the tidal rise being 3½ feet. For the upper river the plane of reference is ordinary low water, the variation in water level being 19 feet at the Atlantic Coast Line bridge, 54½ miles above the mouth, and 20 feet at the junction of the Congaree and Wateree Rivers. The head of navigation is at this point, 143 miles above the mouth.

The commerce for the calendar year 1911 amounted to 62,293 tons, valued at $1,001,344. It consisted mainly of logs and lumber and the freight carried by the steamer line between Georgetown and Columbia, S. C. There was no material change in the commerce.

The improvement allows logs and lumber to be transported. The Santee River is a link in the waterway between Georgetown and Columbia, the effect of which is discussed under Congaree River.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to snagging the river and maintaining the canal. The additional work proposed is necessary to make the improvement available.

The existing project for Santee River makes no provision for increasing the natural depth, which is about 3 feet. A depth of 4 feet has been authorized for the Congaree River. As it is apparent that the main stream should afford facilities at least equal to those found in its tributaries, if practicable, it is recommended that a reexamination of the Santee River be authorized with a view to securing such additional depth as may be warranted by the traffic involved.

July 1, 1911, balance unexpended	$13,165.48
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	10,486.51
July 1, 1912, balance unexpended	2,678.97
July 1, 1912, outstanding liabilities	897.08
July 1, 1912, balance available	1,781.89
Amount appropriated by river and harbor act approved July 25, 1912	15,000.00
Amount available for fiscal year ending June 30, 1913	16,781.89
Amount (estimated) required to be appropriated for completion of existing project	[1] 150,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	([2])

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[1] Exclusive of amount available for fiscal year 1913.

[2] See consolidated money statement on page 477.

(*b*) *Wateree River.*—This river is a continuation of the stream called the Catawba River, which rises in the mountains in the western part of North Carolina and flows in a southeasterly direction across the State. It changes its name to the Wateree at the point where it is joined by the waters of Wateree Creek, in the north central part of South Carolina. It then flows in a southerly direction for 105 miles, where it unites with the Congaree River in forming the Santee River. The stretch from the mouth to Camden (67 miles) is the portion embraced in the project. In its original condition this stream had a low-water depth of from 3 to 4 feet from its mouth, 67 miles, to Camden. The lower 14 miles was completely blocked at all stages of water by logs, snags, etc., and at moderate stages by the bridges of the South Carolina and the Wilmington, Columbia & Augusta Railroads, then without draw spans; thence to Camden navigation was possible, but dangerous, except during high water. Its commerce was practically nothing.

The present project of improvement, adopted in 1881, provides for safe and unobstructed 4-foot navigation for steamers from Camden to the mouth, at an estimated cost of $60,000.

The appropriation of September 19, 1890, completed the estimate for the project, but appropriations have since been made for maintenance. The work is one of snagging and dredging, and as snags are continually lodging it is not susceptible of completion. Snagging work must be done annually in order to keep the channel open.

For reports on examinations of the river upon which the project is based see Senate Document No. 161, Forty-sixth Congress, second session (p. 914, Annual Report, Chief of Engineers, 1880), and page 1034, Annual Report, Chief of Engineers, 1881, all printed without maps. For outline map of the river see page 1190, Annual Report, Chief of Engineers, 1889.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Falls of Catawba to bend 4 miles below Camden.	House	[1] 271	Fifty-first	Second	1891	1487
Camden to mouth	do	[1] 185	Fifty-eighth	do	1904	1629
Do	do	[1] 608	Sixty-first	do		

[1] No maps.

No modification has been made in the existing project since its adoption.

The work during the year consisted in beginning the construction of a steel hull snagboat, and was for maintenance. The expenditures were $1,632.49.

The total amount expended on the existing project up to June 30, 1912, was $162,885.29, of which $102,885.29 was for maintenance. The miscellaneous receipts were $19.67.

Since continued work will be required to maintain the channel the approved project will never be completed. The expenditures have not resulted in a permanent increase in depth. The stream is not at present navigable and it is impossible to state the maximum draft that can now be carried. The plane of reference is ordinary low water. The usual variation in water surface is about 17 feet at a point 4 miles above the mouth and about 28.5 feet at Camden, 67 miles above the mouth.

There was no business on the river during the year. The project has had no effect on freight rates.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to operating the new snagboat now under construction. The additional work proposed is necessary to make the improvement available.

July 1, 1911, balance unexpended	$13,550.70
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,632.49
July 1, 1912, balance unexpended	11,918.21
July, 1. 1912, outstanding liabilities	1,027.91
July 1, 1912, balance available	10,890.30
Amount appropriated by river and harbor act approved July 25, 1912	6,000.00
Amount available for fiscal year ending June 30, 1913	16,890.30
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	([1])

(*c*) *Congaree River.*—This river is formed by the meeting of the Broad and Saluda Rivers, 1 mile above Columbia, S. C. It flows southeasterly about 52 miles till it unites with the Wateree River and forms the Santee River. The stretch from Columbia to the mouth, a distance of 51 miles, is embraced in the project.

In 1886 this stream in its original condition had a low-water depth of 3 to 4 feet from its mouth to the railroad bridge at Columbia, thence 1 foot low-water depth 2 miles farther to its head. The navigation of the lower 49 miles was blocked at all stages of water by the South Carolina Railroad bridge and by sunken logs, snags, and overhanging trees. The navigation of the remaining 2 miles, to the city of Columbia, was prevented by swift currents and numerous rock ledges and bowlders. Its commerce was nothing.

The project of improvement adopted in 1886 proposes to secure a thoroughly cleared 4-foot navigation over the lower 49 miles at all stages of water and a cleared channel through the rock ledges and bowlders above at an estimated cost of $54,500. This project was modified in 1899, when a lock and dam was authorized for extending steamboat navigation through these ledges and bowlders in the river from Gervais Street Bridge, Columbia, to Granby. The open-channel work above Granby was thus eliminated for the time being.

Up to this date $30,673.52 had been expended. Appropriations for the lock and dam were made, amounting to $250,000, $25,000 of which, by authority of Congress, was allotted for the open-channel work. The lock and dam had been completed with the $225,000, and considerable work done in clearing the channel between the lock and the city of Columbia.

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[1] See consolidated money statement on p. 477.

The river and harbor act of March 2, 1907, contained the following proviso in appropriating for this stream: "And the limits of the improvement of the Congaree River shall be extended to include that part of the said river included in the project from Gervais Street Bridge, Columbia, to Granby, S. C." Under this authority the work on the entire length of the river will be prosecuted under allotments from appropriations for improving Santee, Wateree, and Congaree Rivers and the Estherville-Minim Creek Canal, S. C.

In 1905 a survey of the river between the lock and dam and the mouth of the river, made to determine what additional work was required to form a 4-foot channel at all stages of water, showed that in addition to clearing the river of obstructions by snagging, dredging was also required, and that the estimated cost of the project should be increased accordingly.

This project was modified by the river and harbor act of June 25, 1910, in accordance with plan printed in House Document No. 608, Sixty-first Congress, second session, by providing the sum of $56,000, to be applied to the raising of the dam at Granby 2 feet.

For report on examination of the river upon which the original project is based, see House Document No. 254, Fifty-eighth Congress, second session (p. 1140, Annual Report Chief of Engineers, 1885), printed with map. For outline map of the river see page 1194, Annual Report Chief of Engineers, 1889. For report on project for lock and dam, see House Document No. 66, Fifty-third Congress, second session (p. 1183, Annual Report Chief of Engineers, 1896), printed without map.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Head of navigation to Broad River	House	[1] 650	Sixtieth	First		
Head of navigation to mouth	do	[1] 608	Sixty-first	Second		

[1] No maps.

The existing project provides for a thoroughly cleared 4-foot channel at all stages of water from the mouth to Gervais Street Bridge, Columbia.

The work during the year consisted in dredging and snagging to maintain a navigable steamboat channel, this being for maintenance, and in purchasing material and constructing cofferdam for the raising of the dam at the lock just below Columbia. The expenditure were $45,475.12, of which $16,630.44 was for maintenance.

The total expenditures on the existing project to June 30, 1912, were $455,069.52, of which $133,994.67 was for maintenance. The receipts from miscellaneous sources were $120.48. The expenditure of $225,000 on the lock and dam is here included in the total expenditures under this project; this is the first time it has been so reported.

Since continual work will be required to maintain the channel desired, the approved project will never be completed. During the low-water season of 1911 the depths were reduced to about 3 feet. The expenditures have not resulted in a permanent increase of depth. The usual variation in water surface at a point 2 miles above the mouth is about 24 feet and at Columbia 33 feet. The plane of reference is ordinary low water. The length of the improved section is from the mouth to Columbia, or a distance of 51 miles, with the head of navigation at present at Granby, 49 miles above the mouth.

During the calendar year 1911 the commerce amounted to 19,043.66 short tons, valued at $887,496. It consisted of logs and miscellaneous general merchandise. There has been no change in the nature of the commerce during the year.

The effect of the project has had so far no effect on the railroad freight rates, but the operating of the boat line to Georgetown, S. C., allows merchants to bring in goods from northern markets via ocean lines to Georgetown. On such shipments the saving in freight charges during the year was $14,415.24.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to dredging and snagging the channel. The additional work proposed is necessary to make the improvement available.

July 1, 1911, balance unexpended		$97,823.32
Receipts on account of sales		1.40
		97,824.72
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$28,844.68	
For maintenance of improvement	16.630.44	
		45,475.12
July 1, 1912, balance unexpended		52,349.60
July 1, 1912, outstanding liabilities		4,523.39
July 1, 1912, balance available		47.826.21
Amount appropriated by river and harbor act approved July 25, 1912		43,000.00
Amount available for fiscal year ending June 30, 1913		90,826.21
July 1, 1912, amount covered by uncompleted contracts		27.24
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		(1)

CONSOLIDATED.

July 1, 1911, balance unexpended		$124,539.50
Receipts on account of sales		1.40
		124,540.90
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$28,844.68	
For maintenance of improvement	28,749.44	
		57,594.12
July 1, 1912, balance unexpended		66,946.78
July 1, 1912, outstanding liabilities		6,448.38

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[1] See consolidated money statement on this page.

July 1, 1912, balance available	$60,498.40
Amount appropriated by river and harbor act approved July 25, 1912	64,000.00
Amount available for fiscal year ending June 30, 1913	[1] 24,498.40
July 1, 1912, amount covered by uncompleted contracts	27.24
Amount (estimated) required to be appropriated for completion of existing project	[1] 165,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 70,000.00

(See Appendix N 6.)

7. *Operating and care of lock and dam across Congaree River, near Columbia, S. C.*—This service is provided for by the permanent indefinite appropriation for operating and care of canals and other works of navigation, under the provisions of section 4 of the river and harbor act of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act approved March 3, 1909.

The operation and care of the lock and dam across the Congaree River have been provided for by allotments from this appropriation since April 7, 1906. The expenditures during the fiscal year were $11,621.86; the total expenditures have been $44,123.68.

A special emergency allotment of $4,175 was made February 18, 1909, to repair damages caused by extraordinary flood of August, 1908.

(See Appendix N 7.)

8. *Inland waterways between Charleston Harbor, S. C., and Alligator Creek, opposite McClellanville.*—These waterways consist of a series of creeks, sounds, rivers, and bays, which afford a route sheltered for the most part from the sea by the numerous islands which form the outer coast line. The route is tidal throughout, the range of tide varying from about 4.6 to 5.3 feet. It is now obstructed by a number of shallow reaches and narrow, crooked passages, particularly at points where the tides meet. The passage across Bulls Bay, besides being very shallow, is much exposed. The present commerce is comparatively small, as only very small vessels can get through without excessive delays.

The plan of improvement adopted in 1902 provides for a channel between Charleston Harbor and a point opposite McClellanville 4 feet deep at mean low water and 60 feet bottom width, at an estimated cost of $125,290. The project was modified by the river and harbor act of March 2, 1907, to provide for a branch of the channel to Morrisons Landing in McClellanville. The new channel will partly follow the present channels and will partly lie in cuts across the marsh to avoid crooked and dangerous sections. It will pass to the northward of Bulls Bay. A revised estimate made during the fiscal year 1908, based upon work already done, showed that to complete the improvement there would be required $66,000 in addition to the amount originally estimated. All of this has been appropriated.

For report on examination and survey upon which the project is based see House Document No. 84, Fifty-sixth Congress, second session (p. 1908, Annual Report Chief of Engineers, 1900), printed with maps, and page 1133, Annual Report Chief of Engineers, 1903.

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[1] Exclusive of amount available for fiscal year 1913.

For report on preliminary examination of portion of route between Bulls Bay and McClellanville, see page 1114, Annual Report Chief of Engineers, 1887, with maps.

The existing project provides for a channel 4 feet deep and 60 feet bottom width between Charleston Harbor and a point opposite McClellanville, with a branch leading to Morrisons Landing in McClellanville.

During the year a contract was awarded which will complete the project to a point opposite McClellanville and will include the branch to Morrisons Landing at McClellanville. Work under this contract was begun May 27, 1912, and 12,798 cubic yards were removed up to the close of the year; this being new work.

The total amount expended on the existing project to June 30, 1912, was $153,834.40, of which $4,264.05 was for maintenance.

The proportion of the approved project accomplished to June 30, 1912, is 84 per cent. The number of cubic yards removed has been 605,652, and the required channel has been formed except at a few localities, where work will be done under the present contract and completed during the fiscal year 1913. The maximum depth that can be carried is about 3 feet at low water, the tidal rise being about 5 feet. The length of the completed channel will be 43 miles.

The commerce through these waterways for the calendar year 1911 amounted to 44,267 short tons, valued at $924,876. It consisted of cotton and cotton products, fertilizer and other plantation supplies, vegetables, naval stores, timber, oysters, etc. No increased commerce can be expected until the channel is completed to McClellanville.

The improvement can have no effect on freight rates until it is completed.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the waterway. The additional work proposed is necessary to make the improvement available.

July 1, 1911, balance unexpended	$46,024.81
June 30, 1912, amount expended during fiscal year, for works of improvement	3,569.21
July 1, 1912, balance unexpended	42,455.60
July 1, 1912, outstanding liabilities	38.63
July 1, 1912, balance available	42,416.97
Amount appropriated by river and harbor act approved July 25, 1912	15,000.00
Amount available for fiscal year ending June 30, 1913	57,416.97
July 1, 1912, amount covered by uncompleted contracts	35,400.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 25,000.00

(See Appendix N 8.)

9. *Charleston Harbor, S. C.*—This harbor lies on the coast of South Carolina, about 15 miles to the south of the middle point of the coast line. It is 80 miles northeast of the mouth of the Savannah River. From the ocean bar northwest to the southern point of the city of Charleston the distance is 7½ miles; the average width of the

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[1] Exclusive of amount available for fiscal year 1913.

harbor is about a mile. There were originally four channels across the bar, the deepest having about 12 feet depth at low water. Commerce was then using the Pumpkin Hill Channel, about 3 miles south of the present jetty channel. Where the present jetty channel is situated there was then the Swash Channel, with a best depth of 10½ feet of water, too crooked for safe use. The natural channels were shifting in position and variable in depth.

The original project, adopted in 1878, provided for establishing and maintaining, by means of two jetties and auxiliary dredging, a low-water channel of not less than 21 feet depth across the bar. The Swash Channel was selected for improvement. The estimated cost was $3,000,000.

In 1888 it became necessary to modify the height of the crest line of the jetties and to revise the estimate. This increase in the estimate was largely due to the fact that money had been appropriated so slowly that reasonable contract prices could not be obtained. The annual appropriation up to that time had been only 5¼ per cent of the original estimate. In the revised project the jetties were increased in height and length, but no change was made in their position or distance apart. The revised estimates were $4,380,500 if the jetties were brought up to low-water level throughout, and $5,334,500 if brought up 3 feet higher. The former estimate was adopted by Congress in the river and harbor act approved July 13, 1892.

Under this project the jetties were completed in 1895 at a cost of $3,432,223, the north jetty having a total length of 15,443 feet and the south jetty of 19,104 feet, the width between them at the outer ends being 2,900 feet. The jetties had been brought to a height of 12 feet above low water for the greater portion of the length.

Dredging had also been carried on, a seagoing suction dredge having been constructed, and by June 30, 1899, a channel 250 feet wide and 21 feet deep had been procured. The total expenditures on the 21-foot project to this date were $4,037,256.70, of which about $670,000 was for dredging.

The project adopted by the river and harbor act approved March 3, 1899, provided for obtaining a channel at the entrance to Charleston Harbor not less than 26 feet deep at mean low water (mean range of tide about 5.2 feet) and 600 feet wide, by constructing a large seagoing suction dredge, at a cost not exceeding $150,000, and operating her, together with the existing dredge *Charleston*, for three seagoing suction dredges, at a cost not exceeding $150,000, and operating it, as above, was $285,000. Of this amount $175,000 had been appropriated prior to the enactment of the river and harbor act of June 13, 1902, which made available an additional sum of $208,000, increasing to $383,000 the amount authorized for the project for the new dredge and its operation. The entire amount authorized was appropriated.

This project was completed in September, 1906. Up to June 30, 1910, $636,749.86 had been expended, including $41,943.37 for maintenance during the four years since the completion.

This project was modified by the river and harbor act of June 25, 1910, to provide for the dredging of the harbor with a view to providing an entrance channel 28 feet deep at mean low water, 1,000 feet wide beyond the jetties and 500 feet wide between them, at an estimated cost of $371,616, with annual maintenance of about $40,000.

For the report on which the original project was based see page 553, Annual Report Chief of Engineers, 1878, printed with maps. For revision of project and estimate see page 1150, Annual Report Chief of Engineers, 1889, without maps. For report on which 26-foot project was based see House Document No. 83, Fifty-fifth Congress, second session (p. 1551, Annual Report Chief of Engineers, 1899), printed with maps. For report on which 28-foot project was based see House Document No. 499, Fifty-eighth Congress, second session (p. 1574, Annual Report Chief of Engineers, 1904), without maps.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No	Congress.	Session.	Year.	Page.
Charleston Harbor to 30 feet	Senate	[1] 300	Sixty-first	Second		
Do	House	[2] 288	Sixty-second	do		

[1] Contains maps. [2] No maps.

The existing project provides for an entrance channel 28 feet deep at mean low water, 1,000 feet wide beyond the jetties, and 500 feet wide between them.

The river and harbor act approved July 25, 1912, adopted a project for completing a 20-foot-deep channel, 240 feet wide, in Ashley River, S. C., up to Standard Wharf, in accordance with plan printed in Rivers and Harbors Committee Document No. 4, Sixty-second Congress, second session, estimated to cost $51,150, which amount is provided by the act.

This act also adopted a project for improvement of Shipyard Creek in accordance with plan printed in Senate Document No. 350, Sixty-second Congress, second session, which contemplates dredging a channel 15 feet deep and 100 feet wide through the upper mouth of the creek, at an estimated cost of $5,000, which amount is provided by the act, it being understood that any dredging found necessary within the creek with a view to affording access to the wharves shall be done by local interests benefited thereby.

Dredging under the 28-foot project which began August 18, 1910, was continued during the year by the dredges *Sumter*, *Charleston*, and *Winyah Bay*. The total amount removed was 1,332,238 cubic yards, and the expenditures were $148,718.81, all of which was for new work. In addition, under the authority of the river and harbor act of March 3, 1905, authorizing the Secretary of War, in his discretion, to cause the new dredges employed on this work to be utilized, at such times as they are not employed in dredging on the outer bar, for dredging in the channels between said outer bar and the city of Charleston, 128,966 cubic yards were removed from shoals bordering the channel off the southern part of the city. The cost of this work is included in the expenditures for the 28-foot project.

The total amount expended on the existing project up to June 30, 1912, was $257,978.13, all of which was for new work. The total amount of material removed was 2,670,283 cubic yards. The receipts from miscellaneous sources have been $14,750.96.

The proportion of the approved project accomplished up to June 30, 1912, is about 75 per cent. A channel has been secured 28 feet deep at mean low water and at least 250 feet wide, a gain in depth along the central line in the past year of about 10 feet. A depth of 26 feet with a least width of 500 feet still exists in the eastern channel. There is a channel 28 feet at low water and 33 feet at high water from Charleston to the sea, a distance of 9 miles; the maximum draft that can be carried is 31 feet. The mean range of tide is about 5.2 feet.

The exports for the fiscal year 1911 amounted to 292,545 short tons, valued at $43,658,570; the imports 871,187 short tons, valued at $33,729,905, making a total of 1,163,732 tons, valued at $77,388,475. It consisted of cotton, cotton goods, fertilizer materials, provisions, general merchandise, etc. There has been no material change during the year.

The improvement has slightly influenced the rates of marine insurance; otherwise it has had no effect.

The amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied to widening the channel to the project width of 1,000 feet. The additional work proposed is necessary for extension of benefits.

July 1, 1911, balance unexpended	[1] $156,528.07
Receipts account sales during the year	457.01
	156,985.08
June 30, 1912, amount expended during fiscal year, for works of improvement	[1] 148,718.81
July 1, 1912, balance unexpended	[1] 8,266.27
July 1, 1912, outstanding liabilities	[1] 3,634.15
July 1, 1912, balance available	[1] 4,632.12
Amount appropriated by river and harbor act approved July 25, 1912:	
For Charleston Harbor (28-foot channel)	50,000.00
For Ashley River	51,150.00
For Shipyard Creek	5,000.00
Amount available for fiscal year ending June 30, 1912	110,782.12
July 1, 1912, amount covered by uncompleted contracts	[1] 560.00
Amount (estimated) required to be appropriated for completion of existing project	[1] [2] 71,616.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] [2] 71,616.00

(See Appendix N 9.)

10. Archers Creek, S. C.—This stream is a narrow tidal passage lying between Port Royal Island and Paris Island, S. C., and connecting Beaufort River with Broad River. Its length is about 3 miles, all of which is embraced in the project. The least depth before improvement was about 1.6 feet. The tidal range is about 7 feet.

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[1] For 28-foot channel to the sea.
[2] Exclusive of amount available for fiscal year 1913.

The project of improvement adopted by the river and harbor act approved July 25, 1912, provides for a channel 6 feet deep at mean low water with a width of 75 feet, at an estimated cost of $25,000.

For report on examination of the river upon which the project is based see House Document No. 513, Sixty-second Congress, second session (with outline map).

No work has been done and no expenditures have been made. No commercial statistics have been collected.

With the funds appropriated the project will be completed.

Amount appropriated by river and harbor act approved July 25, 1912	$25,000.00
Amount available for fiscal year 1913	25,000.00

(See Appendix N 10.)

11. Removing sunken vessels or craft obstructing or endangering navigation—Wreck off Charleston Harbor, S. C.—For the purpose of making an examination, with a view to removal, of a submerged wreck reported to exist off Charleston Harbor, S. C., an allotment was made July 18, 1911.

An examination was made, but no wreck was found.

The expenditures during the year were $78.66.

(See Appendix N 11.)

EXAMINATIONS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. Preliminary examination, with plan and estimate of cost of improvement, of Charleston Harbor, S. C., with a view to securing a depth of 30 feet.—Reports dated December 7, 1910, and May 15, 1911, are printed in House Document No. 288, Sixty-second Congress, second session. A plan for further improvement at an estimated cost of $140,000 in addition to the amount of $121,616 still unappropriated for completion of the 28-foot project, with $40,000 annually for maintenance, is presented.

2. Preliminary examination of Salkehatchie River to Morris Crossing, S. C.—Report dated January 12, 1911, is printed in House Document No. 457, Sixty-second Congress, second session. The improvement of this locality by the United States in the manner desired is not deemed advisable at the present time.

3. Preliminary examination, with plan and estimate of cost of improvement, of Archers Creek, S. C.—Reports dated September 6, 1910, and January 28, 1911, with map, and supplemental report dated January 5, 1912, are printed in House Document No. 513, Sixty-second Congress, second session. A plan for improvement at an estimated cost of $25,000 for first construction is presented.

The local officer was also charged with the duty of making other preliminary examinations and surveys provided for by the river and harbor act approved June 25, 1910, as follows, and reports thereon will be duly submitted when received:

1. *Waterways from Orangeburg to Charleston, S. C., including cut-off or canal from Edisto River to Ashley River*, with a view to providing a more direct route between said cities than that afforded by existing channels.

2. *Waterways from Columbia and Camden to Charleston, S. C., including cut-off or canal from Santee River by any existing or proposed route to Cooper River or Wando River and any of their tributaries*, with a view to providing a more direct route between said cities than that afforded by exising waterways.

3. *South Fork of Edisto River to Guignards Landing, S. C.*

EXAMINATION OF WINYAH BAY, S. C., MADE IN COMPLIANCE WITH RIVER HARBOR ACT APPROVED FEBRUARY 27, 1911.

Report dated May 29, 1911, on preliminary examination *of the basin of Winyah Bay, S. C.*, with a view to providing a uniform depth of 18 feet at mean low water and to giving increased harbor facilities to the city of Georgetown, required by the river and harbor act approved February 27, 1911, was duly submitted by the district officer. It was reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and was transmitted to Congress and printed in House Document No. 278, Sixty-second Congress, second session. The improvement by the General Government of this locality in the manner apparently desired is not deemed advisable at the present time.

IMPROVEMENT OF RIVERS AND HARBORS IN THE SAVANNAH, GA., DISTRICT.

This district was in the charge of Col. Dan C. Kingman, Corps of Engineers, division engineer, southeast division.

1. *Savannah Harbor, Ga.*—This covers the artificially improved channel across the Bar, the Roads, the Knoll, and the estuary of Savannah River from the mouth of the river to the upper limits of the city of Savannah. The length of this estuary is 17 miles. The distance from the upper limits of the city to deep water beyond the bar is 26 miles, measured along the channel. The width of the channel, as defined by the regulating works, varies from about 600 feet, opposite the city, to 1,800 feet at the mouth of the river. The portion which is being improved for navigation varies from 400 to 600 feet, according to locality and curvature. The harbor is 112 miles, by water, south of Charleston Harbor, S. C., and 111 miles, by water, north of Brunswick Harbor, Ga. In 1873 the channel was in places not more than 9 feet deep at mean low water.

The first appropriation for the improvement of this harbor was made in 1826, and had reference to the removal of natural and artificial obstructions, but the first comprehensive plan of improvement is dated February 11, 1853. Another, for the removal of obstructions, is dated about 1871.

A later plan of improvement is dated August 28, 1873, and was supplemented March 19, 1879. It contemplated the establishment of a channel from the city to the sea, practicable at high tide for vessels drawing 22 feet of water. This project was replaced by an enlarged one (Jan. 16, 1882, Annual Report of the Chief of Engineers for 1882, Appendix J 4) contemplating the same channel depth. The amount expended under these projects up to June 30, 1890, was $1,850,528.53.

The project in force up to June 13, 1902, adopted in 1890, providing for a mean high-water depth of 26 feet from the city to the sea, is printed as part of Appendix O, Annual Report of the Chief of Engineers for 1890. The channel depth contemplated by it was reported as having been obtained at the end of the fiscal year 1896. While the project depth was literally obtained, the channel was very crooked and of much less than the project width.

A supplemental plan of improvement was submitted December 7, 1894, providing for a detached extension of the Oyster Bed training wall, for the purpose of sheltering the anchorage in Tybee Roads, as well as for protecting the ship channel over the outer part of Tybee Knoll against the destructive action of heavy storms. This project, which is printed as part of Appendix M 1 of the Annual Report of the Chief of Engineers for 1895, was authorized by act of Congress of June 3, 1896, its estimated cost being $992,250. This work was never finished, the contract having been annulled in 1899, when less than one-third of the proposed work was accomplished. The same act authorized the completion of work for improving the inside route from Savannah, Ga., to Beaufort, S. C., at an additional cost of $106,700, and dredging for maintenance in Savannah Harbor, and the sum of $1,005,000 was appropriated to complete these works.

The amount expended under the project of 1890 up to June 30, 1896, was $3,460,049.99, of which $974,504.88 was for dredging and $2,356,720.10 for contraction work. There had previously been expended $1,850,528.53, giving a total of $5,310,578.52. Between June 30, 1896, and June 30, 1902, $712,918.84 was expended on the modified 26-foot project, of which $84,850.98 was for maintenance.

From the time of the reported completion of the project of 1890, in July, 1896, until June 30, 1902, extensive dredging was done, both for maintenance and as part of the modification of the project.

On June 13, 1902, Congress adopted a project which provided for the establishment of a channel from the old waterworks (2 miles above Savannah) to the ocean, 28 feet deep at mean high water, with bottom widths of 350 to 500 feet, to be accomplished by dredging and the raising of all existing training walls between Savannah and Tybee Roads. It also provided for the construction of mooring dolphins at two points in the harbor—the "Bight" and Venus Point. The estimated cost of the work was originally $1,567,791. This amount was increased by $210,000 by the act of Congress approved March 3, 1905. This project will be found printed in House Document No. 123, Fifty-sixth Congress, second session, and also in the Annual Report of the Chief of Engineers for 1901, page 1723.

The river and harbor act of March 3, 1905, called for a resurvey of Savannah Harbor, Ga., with plans and estimates of cost, with a view to securing a channel to the sea 26 feet deep at mean low water. The survey was made and the plans and estimates prepared, and will be found printed as House Document No. 181, Fifty-ninth Congress, first session. This project was not at first adopted by Congress in its entirety, but the river and harbor act of March 2, 1907, appropriated $300,000, and in addition authorized continuing contracts in the sum of $700,000 (all of which has since been appropriated) for prosecuting the improvement and for maintenance, in accordance with the plans of the Board of Engineers for Rivers and Harbors, as set forth in the House document just referred to. The recommendation of the board was that the improvement should be undertaken in a tentative manner, with the object of first securing across the bar the maximum depth within the limits fixed by Congress that can be maintained by dredging alone, a 21-foot channel first to be dredged and then gradually deepened until the limit fixed by economy of maintenance is reached. The act authorized such raising and extending of dikes, jetties, and other contraction works as may be necessary at a cost not to exceed $300,000, and the purchase of a pumping dredge of the stationary type at a cost of $125,000. The increased depth gained upon the bar is to be carried up the river by dredging at such a rate as will insure the same navigable depth as is maintained on the bar. For a detailed report of what was accomplished in this experiment, attention is invited to the report of the district officer, Appendix O 1, of the Report of the Chief of Engineers for 1909, pages 1320–1325.

The project was definitely adopted by the river and harbor act of June 25, 1910, with a view to its completion by the 30th of June, 1914, at a cost of $1,545,000, exclusive of previous appropriations, this sum to be appropriated in four annual installments, the first three of $400,000 each and the last in an amount sufficient to make up the balance. This act appropriated $400,000 toward the completion of the project.

The river and harbor act approved July 25, 1912, extended the existing project in accordance with plan printed in House Document No. 563, Sixty-second Congress, second session, so as to provide for improving the Savannah River from the upper limits of the present project to the foot of Kings Island by the excavation of a channel 21 feet in depth at mean low water, and 300 feet in width, at an estimated cost of $140,000, which amount is appropriated by the act, subject to the condition that before the work is undertaken the city of Savannah shall accept the parcel of land near the upper end of the proposed improvement previously offered by interested parties and give assurances satisfactory to the Secretary of War that the city will provide suitable terminal facilities thereat.

The amount expended under the 28-foot project (mean high water) up to June 30, 1908, was $1,643,282.29, of which $214,043.28 was for maintenance. The sum of $672.25 was derived from sales of Government property and deposited to the credit of the appropriation.

The expenditures to June 30, 1912, under the project tentatively adopted March 2, 1907, and ratified by the act of June 25, 1910, amounted to $1,702,797.17, of which $384,647.16 was for maintenance and of which $119,676.21 was disbursed by Maj. J. C. Sanford and Maj. Herbert Deakyne, Corps of Engineers, on account of the construction of the dredge provided for by the project. The sum of $8 was received from the sale of blueprints of the plans of the dredge, and $467.63 from sales of condemned property. Details of the dredge construction will be found in Appendix H 9, Annual Report of the Chief of Engineers for 1908, and in Appendix H 10 of the Annual Report of the Chief of Engineers for 1909. The total amount expended for the improvement of Savannah Harbor up to June 30, 1912, was $9,369,576.82. A total of $1,449.29 was received from sales of condemned property and of blueprints. The sum of $500 was deposited to the credit of the appropriation by the clerk of the United States circuit court for the southern district of Georgia. The sum of $1,000 was deposited to the credit of the appropriation by settlement of claim against the steamship *Boliviana* for damage to mooring dolphin, and this money was applied to repairing it.

The sum of $234.77 was deposited to the credit of the appropriation, by Treasury settlement, on account of old shaft of the United States dredge *Cumberland* used by the United States dredge *Comstock*.

The expenditures made have secured and maintained the various objects had in view in projects heretofore stated, and have advanced the present project in the manner described below.

The mean rise and fall of the tide on the outer bar is 7 feet; on Tybee knoll, 6.8 feet; and at the upper limit of the harbor, 6.4 feet.

During the fiscal year the three United States dredges removed a total of 2,294,017 cubic yards of material, all of which was primary dredging. Of this, 75,162 cubic yards was upon the ocean bar, 516,801 cubic yards in Tybee Roads, 980,554 cubic yards on Tybee knoll, and 721,500 cubic yards from the harbor above Fort Pulaski.

The United States hydraulic dredge *Morgan* rehandled from basins of deposit 1,137,041 cubic yards of material. This material was dredged from the channel by the sea-goers and dumped in these basins, to save the long and expensive trips to sea. The removal of this amount of material during the year has gained on the sea-goers, so that at the close of the year there were left basins capable of holding 350,000 cubic yards, which is about 122,000 cubic yards more than existed at the beginning of the year.

Dredging operations were continued under the contract of October 12, 1910, until October 26, 1911, when the contractor's dredge was burned. The dredge was rebuilt and dredging was resumed on June 25, 1912. During the fiscal year this dredge removed a total of 498,141 cubic yards of material, place measurement, of which 360,966 cubic yards was effective work for the advancement of the project. The remainder, 137,175 cubic yards, was removed outside of the established lines, for which no payment was made.

On July 5, 1911, a contract was entered into providing for certain dredging in the channel opposite the city of Savannah, in Wrecks Channel and in Long Island Crossing Channel, to secure the depths and widths called for by the project at those localities. It was estimated that this work would require the removal of about 1,600,000 cubic yards, but, under the terms of the contract, the contractor can be required to remove whatever amount may be necessary, within the limit of funds available, to accomplish the work proposed. Work under this contract was begun on August 26, 1911, and up to the close of the fiscal year a total of 784,591 cubic yards had been removed, which was effective work for the advancement of the project. In addition, there was 232,200 cubic yards removed outside of the established lines, for which no payment was made. This contractor also removed a total of about 1,600 cypress stumps, encountered in dredging, for which he was paid $42,830.15, in accordance with the terms of his contract.

These two dredging contracts resulted in the removal, during the fiscal year of 1,145,557 cubic yards of material, which was effective for the advancement of the project.

A general survey of the harbor was completed during the month of June, 1912, and the necessary surveys were made during the year to determine the amount of material dredged wherever place measurement was necessary to determine it.

On June 30, 1912, the least depth in the channel, from the foot of West Broad Street, in the city of Savannah, to the sea, was only 22.5 feet at mean low water, due to a short shoal in the Long Island Crossing Channel, and at another point, in the channel along the city front, there was a least depth of 23 feet at mean low water, because the dredge had not completed its cut. Before the end of July, however, both of these shoals had been removed, so that the actual depth from Savannah to the ocean was at least 24 feet at mean low water, equivalent to 30.4 feet at mean high water. Work under the 26-foot project has not yet been carried above West Broad Street, and from this point to the upper limits of the harbor the old project depths obtain, except where they have been reduced near the Seaboard Air Line Railway bridge by the washing down of the sand from above.

The channel along the city front has the project depth of 27 feet, at mean low water, for a width of 250 feet; Wrecks Channel has the same, and between this point and Long Island Crossing the least depth is 25 feet at mean low water. At Long Island Crossing there is a least depth of 24 feet over a channel from 150 to 300 feet in width; and from Long Island Crossing to the sea the least depth is 25 feet at mean low water. On the outer bar the least depth is 25.5 feet at mean low water, but this is for a distance of only 300 feet; elsewhere the depth ranges from 26 to 28 feet, and 75 per cent of the channel area has a depth of 26 feet or over.

On June 30, 1912, 68 per cent of the work proposed had been finished, and 66.8 per cent of the total estimate of cost had been expended. This would indicate that the work remaining to be done can be accomplished within the limit allowed by law, and, indeed, it is not unlikely that at the completion of the project there may be a balance of from $50,000 to $100,000 unexpended.

It is proposed to expend the balance on hand and the additional appropriation recommended in maintaining and carrying forward, as authorized, the general project of 1905, printed as House Document No. 181, Fifty-ninth Congress, first session, and adopted by the acts of March 2, 1907, and June 25, 1910, with only such slight modifications as to the extent of dikes and training walls to be raised and strengthened as experience may indicate to be desirable and necessary and in carrying out, by dredging, the additional work authorized by the river and harbor act of July 25, 1912. The additional work proposed is for the completion of the project.

In 1872 the tonnage of vessels arriving and clearing at Savannah Harbor was reported to be somewhat more than 1,000,000 short tons and the total value of imports and exports about $34,000,000. In 1890 the total tonnage was reported to have increased about 2,000,000 short tons and the value of imports and exports to $152,000,000. For the calendar year 1911 the total amount of freight received and shipped at the port was 2,954,814 short tons, valued at $246,678,077. The commerce consists principally of naval stores, fertilizer, produce, iron, cotton, lumber, and general merchandise.

In the collection of commercial statistics for the calendar year 1911 information has invariably been obtained from primary sources, and collections and tabulations made by committees or boards have not been adopted. This method prevents duplication and, while it may give a result that is too small, it can not give inflated figures. For this reason the comparison of the present statistics with those collected in former years would be misleading.

Attention is invited to a detailed discussion of the commerce of Savannah Harbor contained in Appendix O 1, pages 1327–1329, of the Annual Report of the Chief of Engineers for 1909.

The effect of the improvement upon freight rates since 1896 has been a reduction of from 30 to 50 per cent, according to the nature of the commodity.

The various projects of improvement will be found printed in the following documents:

Senate Executive Document No. 1, Thirty-third Congress, first session, and Annual Report of the Chief of Engineers for 1853, page 468.

Project for removal of Confederate obstructions, Annual Report of Chief of Engineers for 1872, page 653.

Project for 22 feet depth at high water, Annual Report of Chief of Engineers for 1873, page 736, and modifications in the following reports: For 1875, part 2, page 34; for 1876, part 1, page 437; for 1880, part 1, page 933, containing maps; and for 1882, part 2, page 1152.

Project for 26 feet depth at high water, Annual Report of the Chief of Engineers for 1890, part 2, page 1258, and modifications as follows: House Executive Document No. 115, Fifty-third Congress, third session, containing maps; Annual Report of the Chief of Engineers for 1895, part 2, page 1459, and for 1900, part 3, page 1922.

Project for 28 feet depth at high water, House Executive Document No. 57, Fiftieth Congress, first session, containing maps; and Annual Report of the Chief of Engineers for 1888, part 2, page 1057; modifications in House Document No. 123, Fifty-sixth Congress, second session, and Annual Report of the Chief of Engineers for 1901, page 1719 .

Project for 26 feet at mean low water, House Document No. 181, Fifty-ninth Congress, first session, and Annual Report of the Chief of Engineers for 1906, page 311.

A detailed history of the work of improvement may be obtained by consulting Annual Report of the Chief of Engineers for 1888, part 2, page 1013, and report of 1896, part 2, page 1218; also report for 1903, pages 1146–1152, report for 1904, pages 1644–1647, report for 1909, pages 1320–1325, report for 1910, pages 1460–1463, and report for 1911, pages 1592–1594.

References to examination and survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Fig Island to Elba Island and Elba Island to Cockspur Island.					1885 [1]	1202
Head of Elba Island to the sea					1888 [1]	1072
Index map, cross tides to sea; opposite Central of Georgia R. R. wharves: Garden Bank; Upper and Lower Wrecks Channel; obstructions; Duck Puddle Closing Dam; Upper and Lower Flats; Elba Island Spur Dams; Jones Island Spur Dams; Long Island Crossing; Tybee Knoll.					1891 [1]	1496
Hydrographic map, cross tides to the sea; high and low water lines; cross sections; velocity curves; percentage of sea water in North Channel; and comparative profile of thalweg cross tides to sea.					1896 [1]	1245
Upper limits to the sea					1902 [1]	1178
Do					1904 [1]	1646
Do					1906 [1]	1192
Do					1909 [1]	1332
2 miles above upper limits of city of Savannah.	House	[2] 563	Sixty-second	Second		

July 1, 1911, balance unexpended		$597, 936. 65
Amount received from proceeds of sale of Government property		80. 90
		598, 017. 55
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$291, 646. 73	
For maintenance of improvement	104, 200. 00	
		395, 846. 73
July 1, 1912, balance unexpended		202, 170. 82
July 1, 1912, outstanding liabilities		62, 727. 54
July 1, 1912, balance available		139, 443. 28
Amount appropriated by river and harbor act approved July 25, 1912		540, 000. 00
Amount available for fiscal year ending June 30, 1913		679, 443. 28
July 1, 1912, amount covered by uncompleted contracts		118, 146. 95
Amount (estimated) required to be appropriated for completion of existing project		[3] 345, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[3] 345, 000. 00

(See Appendix O 1.)

2. *Cowhead River, Ga.*—This is locally known as "Cowhead Cut," and is a very narrow high-water connection between Tybee Creek and Lazaretto Creek. The cut is without water at low tide. The river and harbor act approved July 25, 1912, adopted a project for the improvement of Cowhead River by the dredging of a straight

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[1] Contains map.
[2] Does not contain map.
[3] Exclusive of amount available for fiscal year 1913.

cut connecting Tybee Creek and Lazaretto Creek, to afford a navigable depth of 6 feet at mean low water with a bottom width of 75 feet, the length of the cut to be about 1,500 feet. This project is printed as House Executive Document No. 109, Sixty-second Congress, first session, which contains a map showing the proposed improvement. The estimated cost of the improvement is $6,000, and the adopted project provides that one-half of this sum should be contributed by local interests, which should also furnish the necessary right of way for the proposed cut free of cost to the United States.

The object of the proposed improvement is to provide a sheltered water route, navigable by light-draft boats at all stages of the tide, from Savannah to the south end of Tybee Island, Ga.

The local interests have made assurances that their half of the estimated cost of the improvement and the necessary right of way will be promptly furnished, and if this is done it is proposed to complete the work early in the fiscal year 1913, using therefor the United States pipe-line dredge *Morgan.*

Amount appropriated by river and harbor act approved July 25, 1912	$3,000
Amount available for fiscal year ending June 30, 1913	3,000

(See Appendix O 2.)

3. Savannah River below Augusta, Ga.—This river is formed by the junction of the Tugaloo and Seneca Rivers, and flows in a southeasterly direction and empties into the Atlantic Ocean. It sources are near the point where the three States of Georgia, South Carolina, and North Carolina come together. Continuous navigation exists over the river from Augusta to the sea, a distance of 219 miles. From Augusta to Savannah the distance is 202 miles. Below Savannah the river is regarded as a part of Savannah Harbor and is improved as such. At Augusta contiguous navigation is stopped by the existence of rapids and by a dam which was erected many years ago for power purposes. Separate appropriations and a separate project have always been had for the improvement of the river above Augusta.

Previous to improvement the river was navigable for the greater part of the year for steamboats drawing from 4 to 5 feet, but during the low-water season there were various shoals in the upper portion of the river, with low-water depths of not more than 2 or 3 feet. The other obstructions consisted of overhanging trees, snags, and sunken logs.

The original project, submitted December 22, 1880, provided for securing a 5-foot channel 80 feet wide, by means of removal of snags, trees, sand bars, etc., and protection of banks, at a cost of $91,000.

Under this project there was expended, prior to operations under the existing project, $93,480.09.

The project adopted in 1890 provides for the establishment of a navigable steamboat channel 5 feet deep at ordinary summer low water between the cities of Augusta and Savannah, to be accomplished by removing sand and gravel bars, regulating portions of the river, revetting caving banks, closing incipient cut-offs, and removing snags and logs from the channel and overhanging trees from the banks of the stream.

The total estimated cost of this improvement, in round numbers, was $332,000, on the supposition that funds would be regularly and adequately supplied, besides $3,000 to $5,000 annually for maintenance.

The river and harbor act of March 2, 1907, called for a survey of the Savannah River for 30 miles below Augusta, Ga., where all of the serious obstructions to navigation were to be found. Report on this survey is printed as House Document No. 962, Sixtieth Congress, first session. It provides a project for the improvement of the entire river, not differing from the project of 1890 in the results to be obtained, but differing in methods of improvement and estimates of cost, particularly for the portion of the river covered by the survey. The total estimated cost of the improvement is $360,000, with an annual cost of maintenance of $10,000 until all of the proposed work has been completed, after which it may be possible to reduce the amount to $4,000 or $5,000 a year. This project was adopted by the river and harbor act of June 25, 1910, and Congress declared its intention to complete the work in four years.

The amount expended upon the work under the project of 1890 up to June 30, 1912, was $542,555.55 (of which $112,247.74 was for maintenance), which, added to the amount previously expended, gives a total expenditure for this work of $636,035.64.

A total of $655.77 has been received from sales of unserviceable property, $2 from the sale of blue prints, and $683.60 from the Seaboard Air Line Railway for use of Government snagboat, all of which has been deposited to the credit of the appropriation.

The work done under the project of 1890 freed the river from snags, stumps, and overhanging trees, although others appear from time to time; shoals and sand bars were removed from a number of localities by training dikes, and the banks were protected in a number of caving bends. A great deal of work still remains to be done, particularly in the upper portion of the river, where the natural conditions are most unstable and where the concave banks must all be protected and where the detritus brought down from the torrential portion of the river above forms shoals after every freshet, which regulating works can never wholly control and which must be periodically removed by dredging.

The work done during the fiscal year consisted of the following: Two thousand one hundred and ninety-nine snags and 204 stumps and a small sunken lighter were removed from the channel and 1,839 overhanging trees and logs cut on the banks of the stream. A shore-protection dike 3,264 feet long at Canoe Cut Bar and a spur dam 150 feet long at the Charleston & Western Carolina Railroad bridge were constructed and a shore-protection dike at Mason's Landing, to be 2,300 feet long, was about 85 per cent completed. In addition, the snagboat *Tugaloo* was employed for 36 days during the year in making minor repairs to existing regulating works. A total of 93,825 cubic yards of material, place measurement, was dredged from four sand shoals to secure the project depth and width of channel. For 16 days during May, 1912, the snagboat *Tugaloo* was engaged, under proper authority, in removing 134 piles and 6 timber braces, forming part of falsework placed by the Seaboard Air Line Railway in connection with repairs to its bridge across the river near Clyo, Ga., there being no private plant available that was capable of doing the work. All expenses of the boat while thus engaged were paid by the railroad company. A quarterboat, coal barge, gasoline launch, and about 400 feet of floating pipe line were provided for use with the pumpboat *Augusta*. All floating plant was kept in proper repair.

Of the work done during the fiscal year the construction and repair of regulating works and the purchases pertaining to the dredge were for the advancement of the project. The dredging and snagging were for maintenance.

As the result of the survey of 1907 a project was prepared which comprised a certain specified number of things to be done for the improvement of the river and gave an estimate of their cost. Of the things therein specified 25 per cent have been completed, and the improvements heretofore made have been well maintained.

At the close of the fiscal year the river throughout the portion under improvement was probably freer from snags than it has ever been before. At the end of the year, on account of the high stage of the river, the depth and width of the channel was far in excess of project requirements. The actual depths on certain of the bars was much less than project requirements, but, as is always the case in alluvial rivers, the bars will cut out as the river falls. At most of the places where the regulating works have been completed the project depth will probably be had. At such other points it will be gained as rapidly as possible by the use of the suction dredge.

It is proposed to apply the available balance and additional appropriation recommended toward the completion of the new project adopted by act of Congress of June 25, 1910, and to keeping the channel cleared of bars and snags and similar obstructions, and to maintain the existing regulating works.

The work proposed is for the completion of the adopted project.

Prior to the improvement the commerce was small, but its quantity unknown. The total commerce of the river during the calendar year 1911 amounted to 40,168 short tons, valued at $5,628,083. It consists principally of cotton and cotton-factory products, naval stores, fertilizers, and general merchandise. There was also rafted down the river during 1911 about 25,000,000 feet b. m. of timber, valued at about $250,000.

The effect of the improvement upon freight rates has been a reduction of from 30 to 50 per cent, according to the nature of the commodity.

The various projects of improvement will be found printed in the following documents:

Original project, Annual Report of the Chief of Engineers for 1881, part 2, page 1088, and House Executive Document No. 23, Forty-sixth Congress, third session, containing map. Modifications of original project, Annual Report of the Chief of Engineers for 1886, part 2, page 1098, and for 1887, part 2, page 1166. Present project, Annual Report of the Chief of Engineers for 1890, part 2, page 1324, and House Executive Document No. 255, Fifty-first Congress, second session, containing map.

A detailed history of the work of improvement may be obtained by consulting Annual Reports of the Chief of Engineers as follows:

Report for 1888, part 2, page 1029; for 1890, part 2, page 1324; and for 1899, part 2, page 1569.

Maps showing the condition of the work at various dates may be found in the following documents:

Annual Reports of the Chief of Engineers for 1883, part 1, page 908; for 1885, part 2, page 1210; and for 1902, part 2, page 1185.

Report on examination and survey of the Savannah River, for 30 miles below Augusta, will be found printed as House Document No. 962, Sixtieth Congress, first session. Report on examination and survey of Savannah River at Augusta, ordered by the river and harbor act of March 3, 1909, will be found printed as House Document No. 487, Sixty-first Congress, first session.

The act of Congress approved June 25, 1910, requires this work to be completed in four years, and the amount estimated for the year 1914 is the amount which should be appropriated in order to permit of compliance with the law.

July 1, 1911, balance unexpended		$119,314.79
Amount received from sale of blue prints		2.00
Amount received for use of Government plant by private parties		683.60
		120,000.39
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$30,470.15	
For maintenance of improvement	21,724.51	
		52,194.66
July 1, 1912, balance unexpended		67,805.73
July 1, 1912, outstanding liabilities		6,411.60
July 1, 1912, balance available		61,394.13
Amount appropriated by river and harbor act approved July 25, 1912		105,000.00
Amount available for fiscal year ending June 30, 1913		166,394.13
July 1, 1912, amount covered by uncompleted contracts		53,093.09
Amount (estimated) required to be appropriated for completion of existing project		[1]115,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1]125,000.00

(See Appendix O 3.)

4. *Savannah River at Augusta, Ga.*—The city of Augusta is situated at the point where the slope of the river changes from a steep to a gradual incline, and consequently is subjected to sudden and severe freshets. These freshets develop a very high velocity of current which attacks the banks of the stream, particularly on the Augusta side, and with every high freshet a loss of bank occurs. The material thus eroded is carried into the river and furnishes the material with which the bars are made, which prevent or obstruct navigation at low water and render the improvement of the river by regulation almost impossible.

The river and harbor act of March 3, 1909, authorized an examination and survey of the river at Augusta, with a view to determining what improvements were necessary in the interest of navigation. Report of this examination and survey will be found printed as House Document No. 487, Sixty-first Congress, second session (without map). This report embodies a project for the riprapping of the river bank along the city front, from Hawks Gully to the steamboat warehouse, a distance of about 7,900 feet, at an estimated cost of $250,000, and recommends that half of this sum be appropriated by Congress and that the other half be provided by the city of Augusta. This project was adopted by the river and harbor act of June 25, 1910, which appropriated $125,000 toward its completion.

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[1] Exclusive of amount available for fiscal year 1913.

During the fiscal year 1911 the city of Augusta deposited $125,000, its half of the cost of the improvement, with the United States Assistant Treasurer, New York, N. Y.

The total amount expended under the project up to June 30, 1912, was $125,530.73, of which $70,347.41 was from the amount appropriated by Congress and $55,183.32 from the amount contributed by the city of Augusta.

The proportion of the approved project accomplished up to June 30, 1912, was about 66 per cent for which about 64 per cent of the funds available have been expended or pledged.

Work has been continued during the fiscal year under contract of February 23, 1911. A total of 23,112 cubic yards of material was dredged toward providing a trench at the toe of the slope of the river bank and 33,916.12 tons of rip-rap stone placed in the trench; 7,491.52 tons of broken stone was placed on the river bank for sub-pavement and 21,937.076 tons of large stone for top pavement.

The work already done has withstood a very severe freshet and there is no doubt but that the proposed improvement will fully accomplish the purpose for which it was designed.

It is proposed to apply the available balance in completing the project.

GOVERNMENT FUND.

July 1, 1911, balance unexpended	$122,653.65
June 30, 1912, amount expended during fiscal year, for works of improvement	68,001.06
July 1, 1912, balance unexpended	54,652.59
July 1, 1912, outstanding liabilities	7,575.93
July 1, 1912, balance available	47,076.66
July 1, 1912, amount covered by uncompleted contracts	46,670.71

SPECIAL FUND.

July 1, 1911, balance unexpended	$125,000.00
June 30, 1912, amount expended during fiscal year, for works of improvement	55,183.32
July 1, 1912, balance unexpended	69,816.68
July 1, 1912, outstanding liabilities	6,691.32
July 1, 1912, balance available	63,125.36
July 1, 1912, amount covered by uncompleted contracts	60,648.70

CONSOLIDATED.

July 1, 1911, balance unexpended	$247,653.65
June 30, 1912, amount expended during fiscal year, for works of improvement	123,184.38

July 1, 1912, balance unexpended	$124,469.27
July 1, 1912, outstanding liabilities	14,267.25
July 1, 1912, balance available	110,202.02
July 1, 1912, amount covered by uncompleted contracts	107,319.41

(See Appendix O 4.)

5. *Savannah River, above Augusta, Ga.*—This river is formed by the junction of the Tugaloo and Seneca Rivers and flows in a southeasterly direction and empties into the Atlantic Ocean. Its sources are near the point where the three States of Georgia, South Carolina, and North Carolina come together. The portion under consideration ends 7 miles above Augusta, where a fixed dam exists across the river at the head of rapids, which completely stops the passage of boats. Below the dam the navigation is extended into the city of Augusta by means of a canal, with locks, which was built in connection with the development of water power, but which affords no navigable connection with the river below.

From the dam, 7 miles above Augusta, to the junction of the Tugaloo and Seneca Rivers, is about 106 miles. The fall is great and unequally distributed. The bottom and banks are generally of rock and navigation, though possible for rafts and pole boats, is exceedingly difficult and dangerous. Only that portion of the river from Petersburg to the dam is at present considered worthy of improvement and has a length of 48 miles. Even in this portion of the river, in its original condition, navigation at low water was very difficult on account of the rapids, shoals and rocks, snags, and similar obstructions.

The original project of improvement, submitted February 8, 1879, provided for a 3-foot channel, 30 feet wide, from Augusta, Ga., to Trotters Shoals, and the removal of snags, trees, etc., to the Tugaloo River, at a cost of $45,000.

Under this project there was expended, prior to operations under the existing project, $39,000.

The existing plan of improvement, adopted by Congress July 13, 1892, provides for the establishment, between Petersburg and the locks, of a downstream channel 12 to 25 feet in width and navigable during ordinary summer low water for pole boats drawing 2 feet, and of an upstream channel navigable for pole boats drawing 1.3 feet of water. This is to be obtained by removing logs and overhanging trees; excavating rocks, sand or gravel, and with excavated materials raising crests of ledges; constructing training walls, to increase flow of water through sluices. The total estimated cost is $33,000.

The total amount expended under the present project up to June 30, 1912, was $27,949.68 (of which $1,470.94 was for maintenance), which, added to that previously expended, gives a total for this work of $66,949.68.

The work accomplished under this project has given a downstream channel about 2 feet deep and an upstream channel of the project depth. In many places, however, these channels are difficult to navigate and are capable of greater improvement.

The proportion of the approved project accomplished up to June 30, 1912, was about 64 per cent.

It is not probable that the original project will ever be carried to completion owing to the fact that authority has been granted by Congress for the construction of two dams, for the development of waterpower, across this portion of the Savannah River. Plans for these waterpower developments have not yet received the approval of the Chief of Engineers or been authorized by the Secretary of War, but it is highly probable that the dams will be equipped with locks and will greatly improve the navigation.

The work done during the fiscal year was for maintenance and consisted of the quarrying and placing of 311 cubic yards of rock in repairing existing regulating works and the opening up of the channel at Rapid Gap, which had been filled with sand by freshets. One large snag was also removed from the pole-boat channel.

It is proposed to apply the available balance and additional appropriation recommended in such work of maintenance as may be necessary and in such other work as may be necessary to supervise the construction of the locks and dams.

In 1876–77 about 2,000 short tons of freight went upstream and about 12,000 bales of cotton came down.

The freight carried on the river consists of cotton, hay, grain, fertilizers, cordwood, and general merchandise. There are no established lines of boats. The freight is transported in flatboats or pole boats belonging to private individuals.

During the calendar year 1911 the commerce amounted to 1,635 short tons, valued at $145,100.

The effect of the improvement has been to render navigation safer and easier, but it is impossible to determine whether it has caused any reduction in freight rates.

The various projects of improvement will be found printed in the following documents: Original project, Annual Report of the Chief of Engineers for 1879, part 1, page 747; present project, Annual Report of the Chief of Engineers for 1890, part 2, page 1366, and House Executive Document No. 213, Fifty-first Congress, first session, containing maps.

A detailed history of the work of improvement may be obtained by consulting the Annual Reports of the Chief of Engineers for 1888, part 2, page 1032, and for 1900, part 3, page 1930.

July 1, 1911, balance unexpended	$1,521.26
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,470.94
July 1, 1912, balance unexpended	50.32
Amount appropriated by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	3,050.32
Amount (estimated) required to be appropriated for completion of existing project	[1] 3,470.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 3,470.00

(See Appendix O 5.)

6. Harbor at Darien and Doboy Bar, Ga.—(a) Darien Harbor.—Darien Harbor comprises the lower 12 miles of Darien River, from the town of Darien to where the river enters Doboy Sound. The river varies in width from 400 to 1,200 feet. Darien Harbor is 56 miles, by water, north of Brunswick Harbor, Ga., and 99 miles, by water, south of Savannah Harbor, Ga.

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[1] Exclusive of amount available for fiscal year 1913.

In its original condition it was obstructed at seven points by shoals, with mean low-water depths of from 6½ to 10½ feet. Between the shoals there was nowhere less than 12 feet at mean low water.

There was expended on this harbor in 1879, for dredging, $8,000, without any project having been recommended or adopted.

The project for the improvement of this harbor, adopted in 1885, contemplates the establishment of a navigable channel 12 feet deep at mean low water between Darien and Doboy, at an estimated cost of $170,000. Work was not begun under this project until 1891.

The total amount expended under it up to June 30, 1912, was $167,292.41 (of which $30,499.20 was for maintenance), which, added to the amount previously expended, gives a total expenditure for this work of $175,292.41.

No modification has been made in the existing project since its adoption. The work under the project has resulted in a navigable channel 12 feet deep at mean low water from Darien to Doboy. The project was reported as completed July 11, 1905.

Dredging operations for restoration of the project depth in Old River and North and South Reach were continued from the preceding fiscal year under contract of November 29, 1910. A total of 45,625 cubic yards of material, place measurement, including all excess, was removed during the fiscal year, which, together with that removed the year before, restored the project depth of 12 feet at mean low water for a width of 80 feet, the available funds being insufficient to restore the full project width of 100 feet.

On June 30, 1912, the controlling depth in the harbor was 11 feet at mean low water. The mean rise and fall of tide varies from 6.5 feet at the town of Darien to 7 feet at the entrance.

The total tonnage for 1878 was estimated at about 200,000 short tons, and the value of exports at between $600,000 and $700,000. The commerce consists almost entirely of lumber and timber, and in 1911 the total shipments amounted to 55,142,000 feet, valued at $810,828. Of this there were 42,542,000 feet rafted through the harbor to Sapelo and to Savannah and Brunswick. The local freight handled at the port in 1911 amounted to 2,050 short tons, valued at $355,622.

The improvement of this harbor has rendered it possible to ship lumber from Darien, which before was impracticable, and has caused a reduction of freight rates of about 15 per cent.

The present project will be found in the Annual Report of the Chief of Engineers for 1885, part 2, page 1238.

A detailed history of the work of improvement may be obtained by consulting the Annual Reports of the Chief of Engineers for 1895, part 2, page 1473, and for 1896, part 2, page 1253.

A map showing the jetties constructed will be found in the Annual Report of the Chief of Engineers for 1895, part 2, page 1477.

By act of Congress approved June 13, 1902, this work was consolidated with Doboy Bar, Ga.

July 1, 1911, balance unexpended	$9,834.01
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	9,760.46
July 1, 1912, balance unexpended	73.55

(*b*) *Doboy Bar.*—In 1888, $5,795.40 was spent in harrowing and water-jet work on this bar without result. In its original condition there was about 12 feet at mean low water in the old channel, which was very crooked, so that the entrance was not much used.

The project for its improvement, adopted by act of Congress of March 3, 1899, provides for creating a channel by dredging 24 feet deep at mean high water and 300 feet wide, estimated to cost $70,000. The proposed channel is some distance north of the old channel. No modification of this project has been made.

The amount expended under the project up to June 30, 1912, was $49,134.04, which, added to the amount previously expended, gives a total expenditure for this work of $54,929.44. No funds have been expended for maintenance.

By act of Congress approved June 13, 1902, this work was consolidated with Darien Harbor.

No work was done during the fiscal year.

The work which has been done under the existing project secured a channel across the bar 150 feet in width, with a controlling depth of 12 feet at mean low water, but this channel was never marked or used, and an examination made in July, 1909, showed that it had shoaled until it had been obliterated. The mean rise and fall of the tide is 7 feet.

Practically no advancement has been made toward the completion of the project, and it is quite doubtful if the desired improvement at this bar can be effected by dredging alone, except at great cost. None of the natural or artificial channels across the bar appear to have any stability. Extensive sand shoals lie to the north and south of the entrance to the sound, and the material composing them is easily transported by the littoral currents, which are very strong in this vicinity under the influence of northeast or southeast winds.

The channel which has been in use for several years affords a depth of about 10 feet at mean low water and has a bad turn in it. The examination of the bar, made in 1909, showed that a better and straighter channel exists just south of the improved channel. with a least depth of approximately 12 feet. This channel has been buoyed out and is used in preference to the south channel.

No additional work is proposed and no appropriation is recommended. Pending authorization by Congress of further work at this locality, this project will be omitted from future annual reports.

The commerce interested in this bar consists of lumber received from the Altamaha River and its tributaries, the bulk of which is now shipped from Sapelo Sound and St. Simons Sound, north and south, respectively, of Doboy Bar. During the calendar year 1911 12,600,000 feet of lumber, valued at $208,400, crossed the bar.

The projects of improvement will be found printed in the following documents:

Original project, Annual Report of the Chief of Engineers for 1887, part 2, page 1179. Present project, Annual Report of the Chief of Engineers for 1897, part 2, page 1539, and House Document No. 13, Fifty-fifth Congress, first session, containing map.

A detailed history of the work of improvement may be obtained by consulting the Annual Reports of the Chief of Engineers, as follows:

Report for 1887, part 2, pages 1179 and 1199; for 1888, part 2, page 1041; for 1889, part 2, page 1573; and for 1901, part 2, page 1639.

(See Appendix O 6.)

7. *Sapelo Harbor, Ga.*—There is no town or commercial harbor on Sapelo Sound. The harbor, so called, is situated on what is known as Front River, a deep tidal creek, 6 miles long, emptying into Sapelo Sound. That portion of the waterway used for purposes of commerce is approximately 2 miles in length, with a width varying from 200 to 1,200 feet. The distance from the wharves to deep water beyond Sapelo Sound is 14 miles. The harbor is about 80 miles by water south of Savannah Harbor and about 66 miles by water north of Brunswick Harbor, Ga. It is shown upon Coast and Geodetic Survey Chart No. 444. Upon it are located certain docks and mooring places made use of for the shipment of lumber and timber brought in rafts from Darien, some 27 miles distant, and from other points along the inside waterway. In the lower 2 miles of river there were three shoals which interfered with navigation. The bulk of the business, however, is carried on below the upper shoal.

The project for the improvement of this harbor will be found printed as House Document No. 561, Sixty-first Congress, second session, with map. It provides for the dredging of a channel through the two lower shoals, 150 feet wide and 17 feet deep, at mean low water, at an estimated cost of $21,000, with such amount for maintenance, not exceeding $1,750 annually, as experience may determine necessary. No modification of this project has been made. The river and harbor act approved June 25, 1910, adopted this project and appropriated $10,000 toward carrying out the improvement.

The balance of the original estimate, amounting to $11,000, was appropriated by the river and harbor act of February 27, 1911.

The amount expended under the project up to June 30, 1912, was $17,905.73.

During the fiscal year 98,297 cubic yards of material was dredged from this locality under contract of November 14, 1910, and supplemental articles of agreement, dated October 2, 1911. The removal of this material provided a channel through the two lower shoals in the harbor having a least depth of 17 feet, at mean low water, and a least width on the bottom of 150 feet. The project is completed.

On June 30, 1912, the controlling depth in the harbor and on Sapelo Bar was 17 feet at mean low water.

The mean rise and fall of the tide on Sapelo Bar is 7 feet and in the harbor 7½ feet.

It is proposed to expend the available balance in maintaining the improved channel should work of maintenance become necessary.

During the calendar year 1911, 19,062,000 feet b. m. of lumber and timber, valued at $289,228, was shipped from the wharves situated on Front River.

Owing to the recent completion of the improvement no data is available as to its effect upon freight rates.

July 1, 1911, balance unexpended	$20,599.02
June 30, 1912, amount expended during fiscal year, for works of improvement	17,504.75
July 1, 1912, balance unexpended	3,094.27

(See Appendix O 7.)

8. *Altamaha, Oconee, and Ocmulgee Rivers, Ga.*—These three improvements were consolidated by the river and harbor act of March 2, 1907.

(*a*) *Altamaha River, Ga.*—This river is formed by the junction of the Oconee and Ocmulgee Rivers, and flows in a southeasterly direction and empties into the Atlantic Ocean. At a point some 25 miles from its mouth the river branches, and the river traffic reaches the ocean by two routes—one by the north branch by way of Darien and the other by the south branch to where it intercepts the inside waterway, which passage is taken to Brunswick.

The river is navigable from the forks to Darien and to where it reaches the inside water route. Its length, from the mouth of the southern branch of its delta to the forks, is 144 miles. The lower section of the river is affected by the tides.

The river is subject to freshets, and in the upper sections the freshet height at times goes 20 feet above the low summer stage. The lower section is bordered by swamp lands, and the freshets rise from 5 to 10 feet over the banks.

Before improvement the Altamaha River was obstructed by rock ledges, sand bars, snags, sunken logs, and overhanging trees. The low-water depths at some points did not exceed 1 foot.

The original project of improvement submitted in 1875 contemplated a channel 4 feet deep and 80 feet wide from Macon to Darien by the removal of sand bars, rock shoals, snags, overhanging trees, etc., at a cost of $162,000.

Under it and its modifications there was expended up to June 30, 1890, $64,776.59.

The project of improvement, adopted by Congress in 1890, provides for the establishment of a channel 3 feet deep at summer low water throughout the river above Darien. This is to be accomplished by removing rock shoals and sand bars, building deflecting dikes, and closing incipient cut-offs, removing snags and sunken logs from the channel and overhanging trees from the banks of the stream, and revetting caving banks. The total estimated cost of the improvement is $129,000, provided funds are regularly and adequately supplied, besides from $3,000 to $5,000 for annual maintenance.

The river and harbor act approved July 25, 1912, adopted the recommendation contained in House Document No. 443, Sixty-second Congress, second session (with map), that these streams are worthy of further gradual improvement, following in general the methods carried on under the existing project by the expenditure of $40,000 annually on the Altamaha, Oconee, and Ocmulgee Rivers, the funds to be applied to maintenance of 3-foot depth during ordinary summer low water up to Milledgeville and Macon and to the gradual increase of channel depths so far as practicable without sacrificing the maintenance work. The act made an appropriation of $40,000 for this purpose, of which $9,000 was allotted to this stream.

The amount expended on the work under the present project up to June 30, 1912, was $132,941.48 (of which $33,371.13 was for maintenance), which, added to the amount previously expended, gives a total expenditure for this work of $197,718.07.

A total of $151.35 has been received from proceeds of sales of unserviceable property, sale of blue prints, and for use of Government plant, and deposited to the credit of the appropriation.

This expenditure has resulted in the removal of 3 rock shoals, 10 sand bars, numerous snags, sunken logs, stumps, and overhanging trees, and the straightening of the river at several points by cut-offs.

The work done during the fiscal year was as follows: Three hundred and sixty-two snags and 21 stumps were removed from the channel, and 510 overhanging trees, logs, and saplings cut from the banks of the stream. A total of 68,320 cubic yards of material was dredged from five sand shoals, which provided channels at four of them having a least depth of 5 feet at summer low water and a least width of 90 feet, and completed about 20 per cent of a similar channel at the fifth. Five hundred feet of old training wall was repaired and raised and 325 feet of new training wall constructed. A 10-inch pump boat, for use on the three rivers forming the Altamaha River system, the construction of which was begun during the preceding fiscal year, was completed and properly equipped and used for the dredging above described, and all old plant pertaining to the improvement was kept in repair.

The construction of new plant, the construction of new regulating works, and the dredging were for the advancement of the project, and a certain portion of the snagging also tended to the same result. It is impossible to estimate exactly how much, but, as nearly as can be determined, about $5,182.49 was expended for maintenance during the year, and the balance for the advancement of the project.

The proportion of the approved project of 1890 accomplished up to June 30, 1912, was about 95 per cent, referred to the old datum plane established by the survey of 1889, upon which the project is based. Referred to this datum plane, there existed throughout the Altamaha River on June 30, 1912, a least depth of 3½ feet, but the survey of this river system made in 1909–1911 showed this datum plane to be about 1 foot too high, so that, although the proposed work of improvement has actually been accomplished on this river, the original plans were not sufficient to afford the low-water depth desired and further deepening in a few localities will be necessary.

It is proposed to apply the available balance and the additional appropriation recommended in removing snags, stumps, and overhanging trees, in removing sand bars and rock shoals, protecting caving banks, and in repairing old works of improvement.

The additional work proposed is for extension of benefits.

The commerce of the river before the improvement was begun was reported to have amounted to about 100,000 short tons annually, valued at about $1,000,000. During the calendar year 1911 it amounted to 9,986 short tons, valued at $676,404. There was also rafted down the river during the same period 33,894,000 feet b. m. of timber, valued at $582,080.

As nearly as can be ascertained the effect of the improvement has been to cause a reduction of from 25 to 40 per cent in freight rates.

The various projects of improvement will be found printed in the following documents:

Original project, Annual Report of the Chief of Engineers for 1875, part 2, page 670; modifications of original project, Annual Report of the Chief of Engineers for 1881, part 2, page 1107, and for 1887, part 2, page 1176; present project, Annual Report of the Chief of Engineers for 1890, part 2, page 1372, and House Executive Document No. 283, Fifty-first Congress, second session, containing map.

A detailed history of the work of improvement may be obtained by consulting the Annual Reports of the Chief of Engineers, as follows: For 1888, part 2, page 1038; for 1889, part 2, page 1246; for 1892, part 2, page 1261; for 1900, part 3, page 1939.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
From the Forks to mouth					1884 [1]	1116
From mouth to the Forks (also includes Oconee and Ocmulgee Rivers	House	[2] 443	Sixty-second	Second		

July 1, 1911, balance unexpended		$26,469.18
Amount received from sale of blue prints		1.50
Amount received for use of Government plant by private parties		38.35
		26,509.03
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$15,893.26	
For maintenance of improvement	5,182.49	
		21,075.75
July 1, 1912, balance unexpended		5,433.28
July 1, 1912, outstanding liabilities		895.16
July 1, 1912, balance available		4,538.12
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		9,000.00
Amount available for fiscal year ending June 30, 1913		13,538.12
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		(3)

(*b*) *Oconee River, Ga.*—The headwaters of this river are in the northeastern part of Georgia. It flows in a southeasterly direction and unites with the Ocmulgee to form the Altamaha River. The head of navigation is Milledgeville, Ga., 145 miles from the mouth.

The river is navigable also for a distance of 17 miles between the Georgia Railroad bridge (54 miles above Milledgeville) and the northern boundary of Greene County. Between Milledgeville and the Georgia Railroad bridge, above, the river is obstructed by obstacles, both natural and artificial, and is incapable of improvement except by an expensive system of locks and dams.

In its original condition this river was used principally for navigation at high stages. At low water there were numerous shoals and snags, there being less than 2 feet on many sand bars and rock ledges.

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[1] Contains maps.
[2] Contains only index map: 14 detailed sheets of survey of the Altamaha River, 12 of the Oconee, and 13 of the Ocmulgee accompanied report, but were not published.
[3] See consolidated money statement on page 509.

The original project was submitted January 29, 1875, and provided for the removal of snags, overhanging trees, etc., cutting off points, and making cut-offs, at a cost of $10,150.

Under this project and its modifications there was expended, previous to the commencement of operations under the existing project, the sum of $44,822.18.

The project of improvement was adopted by Congress September 19, 1890. It provides for the establishment of a navigable channel 3 feet deep at ordinary summer low water from Milledgeville to the mouth. This is to be accomplished by removing rock shoals and sand bars, revetting caving banks, and closing incipient cut-offs, removing snags and logs from the channel and overhanging trees from the banks of the stream. The cost of improvement is estimated at $171,000, besides from $3,000 to $5,000 for annual maintenance. The river and harbor act of March 3, 1905, authorized the expenditure of $3,000 of the amount appropriated to be applied to cleaning out the river from the Georgia Railroad bridge to the northern boundary of Greene County, Ga., thus bringing this short section under improvement.

The river and harbor act approved July 25, 1912, adopted the recommendation contained in House Document No. 443, Sixty-second Congress, second session (with map), that these streams are worthy of further gradual improvement, following in general the methods carried on under the existing project by the expenditure of $40,000 annually on the Altamaha, Oconee, and Ocmulgee Rivers, the funds to be applied to maintenance of 3-foot depth during ordinary summer low water up to Milledgeville and Macon, and to the gradual increase of channel depths so far as practicable without sacrificing the maintenance work. The act made an appropriation of $40,000 for this purpose, of which $7,000 was allotted to this stream.

The amount expended under the present project up to June 30, 1912, was $203,213.50 (of which $31,616.76 was for maintenance), which, added to the amount previously expended, gives a total expenditure for this work of $248,035.68.

A total of $669.27 has been received from sales of unserviceable property, which was deposited to the credit of the appropriation.

As a result of this expenditure, numerous logs, snags, stumps, bowlders, and overhanging trees have been removed, several threatened cut-offs closed and others opened, six training dikes and one spur dam and 900 feet of shore protection built, and 23 rock shoals and several sand shoals removed, all below Milledgeville. Between the Georgia Railroad bridge (54 miles above Milledgeville) and the northern boundary of Greene County, the most troublesome obstructions have been removed from the channel and numerous overhanging trees and logs cut on the banks.

The work done during the fiscal year consisted of the following: One thousand, eight hundred and fifty snags and 165 stumps were removed from the channel and 3,367 overhanging trees and logs cut from the banks and 88 large trees on the banks girdled. At three localities where rock shoals existed a channel was developed having a least width of 60 feet and a least depth of 4 feet at summer low water, the total length of channel improved being 2,004 feet. One hundred and seventy feet of old training wall was repaired and raised, and 250 feet of new training wall and 50 feet of shore protection was built. A 10-inch pump boat, for use on the three rivers composing the Altamaha River system, the construction of which was begun the preceding year, was completed and properly equipped, and all old plant was kept in repair.

All work of rock removal and construction of new plant was for the advancement of the project, and a certain portion of the snagging also tended to the same result. It is impossible to estimate exactly how much, but, as nearly as can be determined, $1,672.29 was expended for maintenance during the year and the balance for the advancement of the project.

The proportion of the approved project of 1890 accomplished up to June 30, 1912, was about 90 per cent, referred to the datum plane established by the survey of 1889, upon which the project was based. Referred to this datum plane, the controlling depth on June 30, 1912, from the mouth of the river to a point 94 miles above the forks, was 3 feet. From the latter point to Milledgeville the controlling depth was 2 feet, this depth existing over a stretch of about 2 miles of river just below the city. The survey of the Altamaha River system made in 1909–1911, however, showed the old datum plane to be about 1 foot too high, so that the actual controlling depths are undoubtedly less than those above given.

No examination was made during the year of the short detached navigable section of the river from the Georgia Railroad bridge, above Milledgeville, to the northern boundary of Greene County, but it is probable that the controlling depth has remained about the same as previously reported, viz, 2.5 feet.

This river occasionally falls below the above-mentioned depths and frequently rises to 20 feet above them.

It is proposed to apply the available balance and additional appropriation recommended toward the removal of snags and stumps from the channel and the cutting of overhanging trees, the removal of rock and sand shoals, in making repairs to existing regulating works, protecting caving banks, and in closing incipient cut-offs and opening others wherever found advisable.

The additional work proposed is for extension of benefits between The Forks and Milledgeville. No additional work above Milledgeville is proposed.

No reliable statistics of the commerce of the river before the improvement was begun are available. During the calendar year 1911 the amount of freight carried on the river between The Forks and Milledgeville amounted to 6,213 short tons, valued at $266,184. There was also rafted on this portion of the river during the same period 9,110,900 feet b. m. of timber, valued at $147,628.

As nearly as can be determined, the effect of the improvement has been to cause a reduction of from 25 to 40 per cent in freight rates.

The various projects of improvement will be found in the following documents: Original project, Annual Report of the Chief of Engineers for 1875, part 2, page 41; present project, Annual Report of the Chief of Engineers for 1890, part 2, page 1432, and House Executive Document No. 211, Fifty-first Congress, first session, containing maps.

A detailed history of the work of improvement may be obtained by consulting Annual Reports of the Chief of Engineers for 1889, part 2, page 1253, and for 1900, part 2, page 1942.

Reference to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Between Dublin and Skull Shoals	House	304	Fifty-eighth	Second	1904 [1]	1677 1679
From the Forks to Milledgeville (also includes Altamaha and Ocmulgee Rivers)	do	[2] 443	Sixty-second	do		

July 1, 1911, balance unexpended		$25,036.15
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$15,980.27	
For maintenance of improvement	1,672.29	
		17,652.56
July 1, 1912, balance unexpended		7,383.59
July 1, 1912, outstanding liabilities		1,517.44
July 1, 1912, balance available		5,866.15
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		7,000.00
Amount available for fiscal year ending June 30, 1913		12,866.15
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		(3)

(*c*) *Ocmulgee River, Ga.*—This river has its headwaters in the northwestern part of Georgia and flows in a southeasterly direction and unites with the Oconee to form the Altamaha River. In its original condition this river was used for navigation chiefly at high stages. At low water there were numerous shoals and snags, there being less than 2 feet on many sand bars and rock ledges. The head of navigation is Macon, a distance of 205 miles from the forks.

The original project was submitted in 1875, and provided for a channel 80 feet wide and 4 feet deep at low water, to be accomplished by the removal of sand bars, rock shoals, snags, overhanging trees, etc., from Macon to Darien, at a cost of $162,000.

The amount expended under this project and its modifications prior to operations under the existing project was $79,390.73.

The project of improvement, adopted by Congress September 19, 1890, provides for the establishment of a navigable channel 3 feet deep at ordinary summer low water from Macon to the river's mouth. This is to be obtained by removing rock shoals and sand bars, closing incipient cut-offs, revetting caving banks, and removing snags and logs from the channel and overhanging trees from the banks of the stream.

The cost of the improvement as given in the project of 1890 is estimated at $210,000, provided funds are regularly and adequately appropriated, besides from $3,000 to $5,000 for annual maintenance.

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[1] Does not contain maps.

[2] Contains only index map; 14 detailed sheets of Altamaha River, 12 of the Oconee, and 13 of Ocmulgee River accompanied report, but were not published.

[3] See consolidated money statement on p. 509.

The river and harbor act approved July 25, 1912, adopted the recommendation contained in House Document No. 443, Sixty-second Congress, second session (with map), that these streams are worthy of further gradual improvement, following in general the methods carried on under the existing project by the expenditure of $40,000 annually on the Altamaha, Oconee, and Ocmulgee Rivers, the funds to be applied to maintenance of 3-foot depth during ordinary summer low water up to Milledgeville and Macon, and to the gradual increase of channel depths so far as practicable without sacrificing the maintenance work. The act made an appropriation of $40,000 for this purpose, of which $20.000 was allotted to this stream.

The amount expended under the present project up to June 30, 1912, was $330,834.17 (of which $41,025.02 was for maintenance), which, added to the amount previously expended, gives a total of $410,224.90.

A total of $802.26, received from sales of unserviceable property, has been received and deposited to the credit of the appropriation.

The work under the present project has resulted in a navigable channel from the forks to Macon. A great deal of work, however, remains to be done between Macon and Hawkinsville.

The work done during the fiscal year consisted of the construction of 506 feet of bank protection, the removal of 741 snags and 32 stumps from the channel, and the cutting of 6,355 overhanging trees and 41 logs, and the girdling of 71 large trees on the banks. A 10-inch pump boat, for use on the three rivers composing the Altamaha River system, the construction of which was begun the year previous, was completed and properly equipped, and all old plant was kept in repair.

The work of bank protection and the construction of new plant was for the advancement of the project, and a part of the snagging also tended to this result. It is impossible to estimate exactly, how much, but as nearly as can be determined $4,558.46 was expended for maintenance during the year, and the balance for the advancement of the project.

The proportion of the approved project of 1890 accomplished to June 30, 1912, was about 95 per cent, referred to the datum plane established by the survey of 1889, upon which the project was based. Referred to this datum plane a 3-foot depth, as provided for in the project, has been practically obtained between the forks and a point 6 miles below Macon, although, if depths be referred to the low-water establishment of the 1909–11 survey, there is a total lineal length of channel of 1.2 miles, which lacks 3 feet at a low summer stage, and including the stretch of 6 miles below Macon, there is a total lineal length of 2.5 miles which lacks a 3-foot depth at a low summer stage, the controlling depth being approximately 2 feet. While it is possible to obtain a 3-foot depth through the sand shoals just below Macon by the raising of the various training walls, this improvement can not be maintained except by the removal of sand shoals by dredging. Provision for doing this has been made and the work will be undertaken in due season.

It is proposed to apply the available balance and the additional appropriations recommended to the removal of logs, snags, stumps, and overhanging trees; in the removal of rock and sand shoals; in the construction of the necessary shore protections and training dikes;

in making repairs to the existing dikes; in closing incipient cut-offs and in opening others wherever deemed advisable.

The additional work proposed is for the extension of benefits.

No reliable statistics of the commerce of the river before improvement was begun are available. In 1911 the freight carried on the river amounted to 12,251 short tons, valued at $821,413. Besides this, 11,000,000 feet b. m. of timber was rafted down the river, valued at $160,900.

As nearly as can be determined, the effect of the improvement has been to cause a reduction of from 25 to 40 per cent in freight rates.

The various projects of improvement will be found printed in the following documents:

Original project: Annual Report of Chief of Engineers for 1875, part 2, page 670.

Modifications of original project: Annual Reports of the Chief of Engineers for 1882, part 2, page 1859; for 1885, part 2, page 1297; for 1886, part 2, page 1160; and for 1887, part 2, page 1276.

Present project: Annual Report of the Chief of Engineers for 1890, part 2, page 1458, and House Executive Document No. 215, Fifty-first Congress, first session, containing maps.

A detailed history of the work of improvement may be obtained by consulting the Annual Reports of the Chief of Engineers for 1889, part 2, page 1258, and for 1900, part 2, page 1944.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
From City Bridge at Fifth Street, Macon, to Juliette, Monroe County, Ga	House	[1] 64	Fifty-ninth	First		
Between Macon and Hawkinsville	do	[1] 858	Sixty-first	Second		
From the forks to Macon (also includes Altamaha and Oconee Rivers)	do	[2] 443	Sixty-second	do		
Near Hawkinsville					1902 [3]	1192

[1] Does not contain maps.

[2] Contains only index map; 14 detailed sheets Altamaha River, 12 of Oconee River, and 13 of the Ocmulgee River accompanied report, but were not published.

[3] Contains map.

July 1, 1911, balance unexpended		$34,746.96
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$18,111.14	
For maintenance of improvement	4,558.46	
		22,669.60
July 1, 1912, balance unexpended		12,077.36
July 1, 1912, outstanding liabilities		104.30
July 1, 1912, balance available		11,973.06
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		20,000.00

Amount available for fiscal year ending June 30, 1913		$31,973.06
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		(1)

CONSOLIDATED.

July 1, 1911, balance unexpended		$86,252.29
Amount received from sale of blue prints		1.50
Amount received for use of Government plant by private parties		38.35
		86,292.14
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$49,984.67	
For maintenance of improvement	11,413.24	
		61,397.91
July 1, 1912, balance unexpended		24,894.23
July 1, 1912, outstanding liabilities		2,516.90
July 1, 1912, balance available		22,377.33
Amount appropriated by river and harbor act approved July 25, 1912		40,000.00
Amount available for fiscal year ending June 30, 1913		62,377.33
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[2]40,000.00

(See Appendix O 8.)

9. *Club and Plantation Creeks, Ga.*—This waterway is a connecting link between a portion of the Inside Water Route and Brunswick Harbor, Ga., affording a protected route for river boats and other small craft. The waterway is 4 miles in length. Its location is shown on Coast Survey Chart No. 157.

A project for dredging a canal 7 feet deep at mean low water, with a bottom width of 50 feet, to connect these two creeks and thus provide an inside route between the Altamaha River and its tributaries and Brunswick Harbor for use of light-draft river boats and timber rafts, will be found printed as House Document No. 159, Fifty-eighth Congress, second session (with map). Besides the dredging of the canal the project provides for the straightening of Plantation Creek and for dredging in both Club and Plantation Creeks where necessary to give a channel 7 feet deep at mean low water. The estimated cost of the work was $40,700. This project was adopted by act of Congress approved March 2, 1907, which appropriated $20,000 toward its completion.

The balance of the estimate, viz, $20,700, was appropriated by the river and harbor act of June 25, 1910.

Portions of the route crossed marsh land owned by private individuals and the city of Brunswick, Ga., and no provision was made in the act for the purchase of a right of way.

During the fiscal year 1909 a legal title was secured, without cost to the United States, from the city of Brunswick for that portion of the desired right of way owned by the city. During the fiscal year 1910, after an extended correspondence, permission was secured, without cost to the United States, from the owners of the balance of the marsh lands for the construction of the rest of the canal.

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[1] See consolidated money statement on this page.
[2] Exclusive of amount available for fiscal year 1913.

A contract for carrying out the proposed improvement was entered into on September 19, 1910, and the improvement was completed on October 26, 1911. During the past fiscal year 64,244 cubic yards of material, pleace measurement, was removed, which added to the amount dredged the year previous, .gives a total of 209,153 cubic yards removed in carrying out the improvement. A small dam was also constructed during the year across the old channel of Plantation Creek, below the cutoff made for straightening this creek, in order to prevent the water from following its former course and to compel it to flow through the cut.

The amount expended to June 30, 1912, was $37,172.59.

With the completion of the project, Club and Plantation Creeks really becomes an integral part of the inside water route between Savannah, Ga., and Fernandina, Fla., in that it becomes a link between the main route and the port of Brunswick, Ga., and there will be no reason for preserving it as a separate work. For this reason no separate estimate is submitted for its future maintenance and this will be cared for in estimates submitted for the inside water route in Georgia after the small balance now on hand is exhausted.

It is proposed to apply the available balance to such work of maintenance as may be necessary to preserve the route.

Commerce and navigation: Since the completion of the improvement this waterway has been largely used, but at this time it is impossible to give any statement of the amount of tonnage.

Report of examination and survey, embodying the present project, will be found printed as House Executive Document No. 159, Fifty-eighth Congress, second session, and on pages 1669–1674 of the Annual Report of the Chief of Engineers for 1904. This document contains a map of the proposed improvement.

July 1, 1911, balance unexpended	$22, 369. 28
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	18, 841. 87
July 1, 1912, balance unexpended	3, 527. 41

(See Appendix O 9.)

10. Brunswick Harbor, Ga.—This embraces the improved channel across the bar, St. Simons Sound, Brunswick River, East River to the upper limits of the city, and Turtle River to the Southern Railway dock; also that portion of Academy Creek used by shipping interests. The distance from the city to deep water beyond the bar is 14½ miles. The lower portion of St. Simons Sound affords an anchorage basin 6,000 feet by 3,000 feet, having a controlling depth of 30 feet at mean low water. The upper portion of the sound affords an anchorage basin 2 miles long, with a width varying from 2,000 to 3,000 feet, having a controlling depth of 24 feet at mean low water. The harbor is 111 miles by water south of Savannah Harbor, Ga., and 46 miles by water north of Fernandina Harbor, Fla.

In its original condition the ruling depth in East River was 9 feet at mean low water, and across the bar the ruling depth was variable. Prior to 1879 it appears to have been 17 feet at mean low water, and this a few years later was reduced to about 13 feet.

The original project of improvement, dated April 29, 1876, provided for the construction of a jetty at the city front and dredging, at a total cost of $69,000.

Under this project and its modifications there was expended prior to operations under the existing project the sum of $190,000.

The project in force up to June 13, 1902, was adopted by Congress in 1894. It provided for the maintenance of a navigable channel 15 feet deep at mean low water by keeping the existing works in repair and by dredging. The act of June 3, 1896, provided for the improvement of Academy Creek. The cost of maintaining a channel depth of 15 feet at mean low water was estimated at $15,000 per annum.

There had been expended under this project up to June 30, 1902, $34,817.25, all of which had been for maintenance.

Including $10,000 spent in 1836 for dredging, the total amount expended up to June 30, 1902, on the inner harbor was $234,817.25.

The act of Congress approved June 13, 1902, adopted a project providing for a navigable channel 21 feet deep at mean low water in Brunswick inner harbor, at a cost of $120,000, and for a channel across the outer bar 19.3 feet deep at mean low water (26 feet at mean high water), at a cost of $40,000. The improvement of the bar had previously been carried on by direct contract between Congress and a private individual. It also provided for dredging in Academy Creek at not to exceed $5,000. This project was completed in July, 1905, and expenditures since have been for maintenance.

The river and harbor act of March 3, 1905, authorized the expenditure from the amount therein appropriated of $5,000, or so much thereof as might be necessary, for maintaining in Academy Creek, immediately in front of and adjacent to the wharves thereof, to the Old Altamaha Canal a depth equal to the controlling depth on the shoals at the lower end of the city in East River, provided that no money should be expended inside harbor lines theretofore or thereafter established in said creek. With these funds a channel was dredged to a depth of 18.5 feet at mean low water and a width ranging from 50 to 90 feet.

The amount expended to June 30, 1907, under the project approved June 13, 1902, was $193,062, of which $19,596.82 was for maintenance. This, added to the amounts previously expended, gives a total expenditure for the work up to June 30, 1907, of $697,879.25.

The result of this expenditure was the accomplishment of a navigable channel throughout the inner harbor 21 feet deep at mean low water and of a channel across the outer bar 19.3 feet deep at mean low water; also of a narrow channel in Academy Creek above mentioned.

A new project was adopted by the act of Congress approved March 2, 1907. This project will be found printed as House Document No. 407, Fifty-ninth Congress, first session (with map). It provides for creating and maintaining throughout the inner harbor (embracing Turtle River from the Southern Railway docks to its junction with Brunswick River and Academy Creek from Aiken's wharf to its junction with East River) and the outer harbor (embracing the outer bar, the navigable channel throughout the entrance to St. Simons Sound, and up Brunswick River to Brunswick Point) channels having a depth of 30 feet at mean high water, with widths varying from 150 feet in Academy Creek to 400 feet across the outer bar, to be accomplished mainly by dredging; but the extension of the existing training wall in East River and the construction of two spur dikes is also authorized. The estimated cost of the work is $496,650, with a yearly cost of maintenance not exceeding $33,250.

Congress in adopting this project appropriated the sum of $146,650 for the work and authorized contracts covering labor and materials necessary for its completion at a cost not to exceed $350,000 additional, all of which has been appropriated.

The amount expended under the present project up to June 30, 1912, was $606,554 (of which $62,550.76 was for maintenance), and resulted in securing the proposed depths and widths of channel called for by the project.

The total amount expended for the improvement of Brunswick Harbor up to June 30, 1912, was $1,304,433.25.

During the fiscal year the following work was done: Eight thousand, one hundred and fifty-eight and five-tenths cubic yards, place measurement, of refractory material was removed, under contract, from the lower shoal in Turtle River, which completed the removal of all of this class of material which was encountered during dredging under previous contracts.

For raising the training wall in East River, 3,794.9 tons of stone was placed, under contract, which raised 4,200 feet of the structure (or within 200 feet of its lower end) from about 3 feet above mean low water to the elevation of mean high water.

The U. S. seagoing dredge *Galveston*, rented from the Galveston (Tex.) district, removed a total of 391,714 cubic yards of material, bin measurement, from the channel across the outer bar, restoring this channel to the project depth of 30 feet at mean high water, with a minimum width of 400 feet.

The necessary surveys were made to determine the progress of the work, all survey launches pertaining to the improvement were kept in repair, and the suboffice at Brunswick was maintained.

The removal of refractory material was for the advancement of the project. All other work done during the fiscal year was for maintenance of the improvement.

The removal of the refractory material in lower Turtle River completes the project for dredging, as adopted by the act of Congress of March 2, 1907, the proposed widths and depths of the various channels having been once secured. As is usually the case, however, in such artificial channels, a moderate shoaling has taken place and dredging has already been necessary to restore the project dimensions. In the inner harbor shoaling has occurred in East River and also in Academy Creek. In the former locality this shoaling amounts to approximately 40,000 cubic yards, which has had the effect of diminishing the project width of the channel and has reduced the controlling depth to about 29 feet at mean high water.

The shoaling in Academy Creek has been greater in quantity, being nearly double the yardage in East River, and it has reduced the controlling depth to about 17 feet at mean low water. The depth in this creek has been unusually difficult to maintain, owing to the lack of tidal flow sufficient to cause scour. It may be necessary to consider the question of either ceasing to maintain depths in this creek, thereby forcing a movement of the wharves now established upon it, or else to devise some special works whereby the strength of the ebb-tide flow can be augmented.

Upon the crest of the bar there has also been some shoaling which has had the effect of reducing the width of the channel for a short distance to about 200 feet. The full project depth, however, is still available. The deposit upon the bar seems to go on at a rate of about 10,700 cubic yards per month. It is interesting to note that this is almost exactly the amount that was estimated in the project adopted in 1907.

The construction of two small jetties and the extension of a third has formed a part of the project of 1907. The object of this construction was simply to reduce the cost of maintenance and it has not yet been demonstrated that it will have that effect. It is not considered advisable to build these works until the necessity for them has been more clearly indicated.

The mean rise and fall of tide on the bar is 6.6 feet, and at Brunswick Point and at the city of Brunswick it is 7 feet.

It is proposed to apply the available balance and the additional appropriation recommended in maintaining the improvement by dredging.

Before improvement in 1880 the annual commerce of Brunswick Harbor amounted to about 100,000 short tons, valued at $1,700,000. The total commerce of the port for the calendar year 1911 amounted to 704,252 short tons of freight, valued at $44,506,731. The commerce consists principally of cotton, lumber, crossties, naval stores, and general merchandise.

The effect of the improvement has been to cause a reduction of ocean-going freight rates on lumber of 25 per cent and on naval stores of 30 per cent. It has also permitted the regular line coastwise freight steamers to enter and leave the port regardless of the tides, thereby avoiding much loss of time.

The various projects of improvement will be found printed in the following documents:

First plan: Annual Report of the Chief of Engineers for 1876, part 1, page 489. First project: Annual Report of the Chief of Engineers for 1880, part 1, page 962. First revision of project: Annual Report of the Chief of Engineers for 1886, part 2, page 1113, and for 1887, part 2, page 1184. Second revision of project: Annual Report of the Chief of Engineers for 1895, part 2, page 1494. Third revision of project: House Document No. 40, Fifty-sixth Congress, first session, containing map. Project for bar: Annual Report of the Chief of Engineers for 1892, part 2, page 1327, and House Executive Document No. 34, Fifty-second Congress, first session, containing map. Revised project for bar: House Document No. 179, Fifty-sixth Congress, second session; House Document No. 355, Fifty-sixth Congress, second session, containing map, and Annual Report of the Chief of Engineers for 1901, part 2, page 1663.

The present project will be found printed as House Executive Document No. 407, Fifty-ninth Congress, first session, which contains maps of the improvement.

A detailed history of the work of improvement may be obtained by consulting the Annual Reports of the Chief of Engineers for 1888, part 2, page 1047; for 1889, part 2, page 1258; for 1890, part 2, page 1407.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Lower portion of East River					1880 [1]	962
Do					1881 [1]	1116
Do					1883 [1]	922
Do					1885 [1]	1228
Do					1886 [1]	1116
Do					1887 [1]	1196
Do					1889 [1]	1266
Do					1892 [1]	1230
Do					1893 [1]	1582
Sketch of entire harbor					1894 [1]	1500
Inner Harbor					1899 [1]	1586
Brunswick River, East River, Academy Creek and Turtle River, St. Simons Sound, and Outer Bar					1909 [1]	1346
Investigation of wharfage privileges at Brunswick Harbor [2]	House	826	Sixtieth	First	1908	341

July 1, 1911, balance unexpended		$87, 913. 93
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$51, 203. 59	
For maintenance of improvement	24, 493. 59	
		75. 697. 18
July 1, 1912, balance unexpended		12, 216. 75
July 1, 1912, outstanding liabilities		270. 60
July 1, 1912, balance available		11, 946. 15
Amount appropriated by river and harbor act approved July 25, 1912		33, 250. 00
Amount available for fiscal year ending June 30, 1913		45, 196. 15
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[3] 33, 250. 00

(See Appendix O 10.)

11. Satilla River, from the mouth to Burnt Fort, Ga.—This river has its headwaters in the southeastern part of Georgia. It flows in a southeasterly direction until it reaches a point just beyond Burnt Fort, when it changes and flows in an easterly direction and empties into St. Andrews Sound. It is approximately 250 miles in length. The distance from the mouth to Burnt Fort is 52 miles. At Burnt Fort the river has a width of about 300 feet, which gradually increases until the mouth is reached, where the width is over 3,000 feet. From the mouth to Owens Ferry, 30 miles above, there are six shoals over which the depth varies from 11½ to 13 feet at mean low water, the general depth over this section being 20 feet. From Owens Ferry to Burnt Fort the low-water depth varies from 14 feet to 8 feet, with a least depth of 6 feet, just below the last-named point. The present head of navigation for ocean-going vessels is Owens Ferry, though light-draft vessels occasionally go to Baileys Mill, 10 miles above. River boats can go up as far as Burnt Fort. The mean rise and fall of the tide varies from 6.9 feet at the mouth to 3.4 feet at Burnt Fort.

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[1] Contains maps.
[2] Does not contain maps.
[3] Exclusive of amount available for fiscal year 1913.

The project of improvement, as adopted by the river and harbor act of July 25, 1912, provides for the removal of snags and similar obstructions between the mouth and Burnt Fort, so as to make the river safe for boats of 6-foot draft at low water. The estimated cost of this work is $10,000, which sum is also intended to provide for maintenance for a few years. This amount was appropriated by the act above mentioned. The report of the examination and survey, upon which the project was based, will be found printed as House Executive Document No. 41, Sixty-second Congress, first section; this document does not contain a map of the survey.

During the calendar year 1910 the annual commerce was estimated to have amounted in value to $605,000.

Amount appropriated by river and harbor act approved July 25, 1912	$10,000.00
Amount available for fiscal year ending June 30, 1913	10,000.00

(See Appendix O 11.)

12. Inside water route between Savannah, Ga., and Fernandina, Fla.—This route consists of a series of bays and tidal sloughs, making a continuous waterway not exposed to ocean waves except at a few points where it crosses the wider sounds. Vessels have not always used the same route. In its natural condition the usual route afforded a depth of not less than 3 feet at extreme low water. This minimum depth occurred at only a few points; elsewhere the depth was ample. The first improvement had reference to particular localities and not to the route as a whole. The improvement of Romerly marsh was begun as early as 1882 and of Jekyl Creek in 1887, but no project of improvement was adopted for the route as a whole until 1892. The waters forming the route as it existed at this time are shown on Coast Survey Charts Nos. 156 and 157, of that date. The project of 1892 provided for the formation of a navigable channel 7 feet deep at mean low water. The estimated cost of improvement was $105,000, provided the entire sum be made available at one time. The total amount was reached with the appropriation made by the river and harbor act of March 3, 1905, but the improvement was still unfinished, because the appropriations had been small in amount and extended over a very long period, as fully set forth in the Annual Report of the Chief of Engineers for 1906, page 1208.

The route has been modified since the beginning, sometimes by special projects for which separate appropriations were made, as in the case of Skidaway Narrows and Club and Plantation Creeks, and at other times by modifications made in the ordinary course of maintenance. The effect of these changes has been to shorten the route, or to make it easier of navigation, or to afford greater shelter. Its length as it exists at present, from Savannah to Fernandina, is 151 miles. Touching at Darien increases the distance by 8 miles and at Brunswick by 10 miles.

The total amount expended under the project of 1892 up to June 30, 1912, was $171,576.91 (of which $107,066.97 was for maintenance), which, added to the amount expended for Jekyl Creek and Romerly marsh, viz, $71,108.77, makes a total of $242,685.68. The sum of $664.40 was collected during the past year from the surety on contract of failing contractors and deposited to the credit of the appropriation.

The river and harbor act of March 2, 1907, provided for a resurvey of the entire waterway, to determine the best route for further improvement. Report of this survey, with estimate of cost, is printed as House Document No. 1236, Sixtieth Congress, second session, which embodies a plan of improvement with estimate of cost. This document contains an index map of the waterway showing the new route to be improved. This project was adopted by the river and harbor act approved July 25, 1912. It provides for a continuation of the improvement to the same general depth of 7 feet, at mean low water, but with a widening of the channel from a minimum width of 50 feet to a uniform width of 150 feet. It also provides for a departure from the main route, as it previously existed, in two instances: First, from Romerly Marsh to Skidaway Narrows, and, second, from Mud River to Front River, and also for the improvement of auxiliary channels, as follows: Threemile Cut, near Darien, on the branch route between Darien and Brunswick, with a depth of 7 feet at mean low water; route around St. Simons and St. Andrews Sounds, affording a low-water depth of 3 feet, and a branch route to reach the wharves along the southerly end of Cumberland Island, affording a low-water depth of 8 feet. The plan also provides for including the proposed route by way of Club and Plantation Creeks as an integral part of the improvement. The improvement of the Club and Plantation Creeks route has since been completed.

The estimated cost of the improvement is $237,700. This includes the amount necessary to complete the Club and Plantation Creeks improvement, viz., $20,700, which amount was provided in the river and harbor act of June 25, 1910. The estimates should therefore be reduced to $217,000. This provided for the payment of $75,000 toward the purchase of a dredge to use upon this route and in the improvement of the Savannah River below Augusta, Ga., but due to the delay in adopting the project the necessary plant for the Savannah River has already been acquired and it is certain that $75,000 would not be sufficient to procure a suitable plant for the inside waterway, and it is doubtful if purchase of a dredging plant would be justifiable for this work alone. The question of omitting the purchase of a dredge and executing the work by contract will receive due consideration. The report upon which the appropriation is based indicates that, under the circumstances, the latter method would be the most justifiable.

All work during the fiscal year was for maintenance and consisted of the dredging of 27,744 cubic yards of material, place measurement, from Mud River, which restored the project width and depth of channel at that locality, and the raising of 850 feet of the training wall in Jekyl Creek to about the elevation of mean high water by the addition of 1,024.6 tons of small stone. The necessary surveys were also made to determine the amount of material removed by dredging.

The project depth of 7 feet, at mean low water, has been obtained throughout the route, with the exception of the link known as Skidaway Narrows, which was originally improved under a separate project calling for a 6-foot depth. This link is now an integral part of the inside water route. Recent surveys and examinations along the route show that the controlling depths at all points where it is less than 7 feet, at mean low water, are as follows: Mouth of St.

Augustine Creek, 6½ feet; Skidaway Narrows, 6½ feet; Florida Passage, 5½ feet; Little Mud River, 6½ feet. There are a number of places still remaining where the project width has never been obtained, but the project of 1892 may be regarded as about 90 per cent completed.

The mean rise and fall of the tide varies at different localities from 6½ to 8 feet, so that by waiting on the tides at least 12 feet can be carried from Savannah to Fernandina.

It is proposed to apply the available balance and additional appropriation recommended toward carrying out the new project provided by the river and harbor act of July 25, 1912, and toward maintaining a depth of 7 feet, at mean low water, throughout the route by dredging and by repairing and extending the existing regulation works, if necessary.

The value of the commerce passing over this route was estimated in 1890 at between $200,000 and $300,000 per annum. During the calendar year 1911 the commerce amounted to 167,730 short tons, valued at $2,430,682. This includes lumber and timber towed over the route in rafts. Little, if any, of this commerce passed over the whole extent of the route.

Between Brunswick and St. Andrews Sound 22 vessels were towed through Jekyl Creek during the calendar year 1911, which otherwise would have had to enter through St. Andrews Sound, involving an additional cost to the charterers. The towing of timber rafts is also carried on to much better advantage now than before improvement and less time is now lost waiting on the tide where shoals previously existed.

It is impracticable to determine the effect of this improvement upon freight rates, as at present the different portions of the route are used locally, and comparatively few vessels engaged in commerce pass over the entire length of it.

The project of 1892 will be found in the Annual Report of the Chief of Engineers for 1892, part 2, page 1309, and House Executive Document No. 41, Fifty-second Congress, first session (containing map).

A detailed history of the work of improvement will be obtained by consulting the Annual Reports of the Chief of Engineers, as follows: Report for 1892, part 2, page 1309; for 1893, part 2, page 1206; and for 1901, part 2, page 1653.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Frederica River	House	[1] 220	Fifty-eighth	Second	1904 [1]	1674–1676
Club and Plantation Creeks	do	[2] 159	do	do	1904 [1]	1669–1674
Savannah to Fernandina	do	[2] 1236	Sixtieth	do		
Do					1911 [2]	1620

[1] Does not contain map.

[2] Contains map.

July 1, 1911, balance unexpended	$42,500.00
Collected from surety on contract of failing contractors	664.40
	43,164.40
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	11,576.91
July 1, 1912, balance unexpended	31,587.49
July 1, 1912, outstanding liabilities	93.53
July 1, 1912, balance available	31,493.96
Amount appropriated by river and harbor act approved July 25, 1912	40,000.00
Amount available for fiscal year ending June 30, 1913	71,493.96
Amount (estimated) required to be appropriated for completion of existing project	[1] 177,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 100,000.00

(See Appendix O 12.)

13. Fernandina Harbor, Fla., and Cumberland Sound, Ga., and Fla.—These two works of improvement were consolidated by the river and harbor act approved June 25, 1910.

(*a*) *Fernandina Harbor.*—As will be seen from Coast Survey Chart No. 453, the lower end of Amelia River forms a deep basin opposite the city of Fernandina, which portion of the river is known as Fernandina Harbor. The lower end of the harbor connects with Cumberland Sound and is 3½ miles from the bar. The harbor is about 1,300 feet in width at the entrance and about 2 miles long. It embraces about 160 acres of well-sheltered anchorage ground with a depth greater than 25 feet at mean low water, but is somewhat obstructed by small shoals. The harbor is located 58 miles, by water, north of Jacksonville Harbor, Fla., and 128 miles, by water, south of Savannah Harbor, Ga.

A project providing for such extensions of the depth and width of the channel in front of the city of Fernandina as will meet the requirements of commerce will be found printed as House Document No. 388, Fifty-ninth Congress, first session.

The improvement proposed consisted in dredging a channel with widths varying from 400 to 600 feet and depths from 20 to 24 feet at mean low water, in front of and to a short distance above (southwest of) the city of Fernandina. The estimated first cost of this work was $115,000, with $15,000 at periods of every two or three years for maintenance after completion.

This project was adopted by act of Congress approved March 2, 1907, which appropriated $115,000 for its completion.

Work under the project was begun September 14, 1907, and completed July 28, 1908.

No work was done during the fiscal year other than the making of an examination of the improved channel to ascertain its condition at the close of the year.

On June 30, 1912, the controlling depths in the channel fronting the city of Fernandina were as follows: From the mouth of Lanceford Creek to the upper end of Hill's dock, 22 feet ,at mean low water, and from this latter point to the entrance to the inner harbor, 24 feet, at mean low water, except on one small lump, opposite Center Street, which has a depth of 23 feet, at mean low water, over it. Very little shoaling has taken place since the project was completed. Soundings indicate some caving in of the sides, with the depth on the edges of the channel slightly diminished.

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[1] Exclusive of amount available for fiscal year 1913.

The mean rise and fall of the tide is 6 feet.

The amount expended under the present projects for the improvement of Fernandina Harbor and Cumberland Sound up to June 30, 1912, was $2,644,629.53, of which $434,691.54 was for maintenance. Up to the time these two works were consolidated under the title "Improving Fernandina Harbor, Fla.," viz., June 25, 1910, there had been expended under the present projects for each work the following: For Cumberland Sound, $2,468,023.71 (of which $368,139.31 was for maintenance), and for Fernandina Harbor, $110,053.59. The total amount expended for these two works up to June 30, 1912, was $3,577,129.53. A total of $14.40 was received from the sale of blue prints and unserviceable property and deposited to the credit of the appropriation.

It is proposed to expend the available balance and additional appropriation recommended in maintaining the improvement.

Before the improvement of Cumberland Sound, in 1879, which constitutes the ocean entrance to Fernandina Harbor, the annual in and out bound tonnage at Fernandina was about 300,000 short tons, and the value of imports and exports estimated at about $2,500,000. The commerce of the port during the calendar year 1911 amounted to 511,133 short tons, with a value of $10,113,836. The chief articles of export are lumber, phosphate rock, and naval stores.

The effect of the improvement of Cumberland Sound has been to cause a reduction in freight rates of from 25 to 40 per cent. It has not been practicable as yet to determine what further effect, if any, the improvement of Fernandina Harbor has had upon these rates.

The present project will be found printed as House Executive Document No. 388, Fifty-ninth Congress, first session, containing map. See also Annual Report of the Chief of Engineers for 1910, page 404.

A map showing conditions June 30, 1908, will be found opposite page 1358, Annual Report of the Chief of Engineers for 1908.

(b) *Cumberland Sound, Ga. and Fla.*—The entrance to Cumberland Sound affords an anchorage basin, between the jetties, 4 miles in length, with an average width of 2,000 feet and a depth varying from 24 to 60 feet at mean low water. The distance from the 36-foot curve outside the entrance to the city wharves is 7 miles.

In its original condition the available depth of the entrance varied from 11 to 12.5 feet at mean low water. The point of crossing the bar was subject to very great changes in location, moving in a series of years as much as 1½ miles.

The project of improvement submitted in 1879 and revised by a Board of Engineers in 1891 provides for the construction of two low jetties from the shore on opposite sides of the entrance and extending seaward across the bar upon lines so direct that the ends will be parallel to each other and about 3,900 feet apart. These jetties were intended to establish a low-water channel across the bar not less than 19 feet in depth. The cost of the improvement was originally estimated at $2,071,023, and as modified at $1,606,500 for the completion of low jetties and at $2,079,500 if high jetties were found necessary. There was expended under this project $932,500.

The present project, which was adopted by act of Congress of June 3, 1896, provides for the establishment of a channel across the bar 19 feet deep at mean low water by the construction of two jetties of stone, built to the level of high water, and resting on a foundation of brush mattresses, on the same lines as those in the previous project, the scour between the jetties to be aided by dredging, if necessary, the total cost of the improvement, at the time of this project, to be $2,350,000, exclusive of amounts previously appropriated.

For amount expended in the improvement of Cumberland Sound, see statement under (*a*) Fernandina Harbor.

By this expenditure two stone jetties have been constructed and a seagoing dredge provided, which together produced a navigable channel with a minimum width of 400 feet and a controlling depth of 24.5 feet at mean low water.

All work done during the fiscal year was for maintenance, and consisted of the following: Forty-seven thousand two hundred and sixty-two cubic yards of material was dredged from the jetty channel by the U. S. seagoing dredge *Galveston*, hired from the Galveston (Tex.) district. In raising low places in the two jetties there was placed 10,520.45 tons of stone under contract, and [illegible]44 tons of stone and 30 tons of brick and old concrete by hired labor. The work done by hired labor was at the shore end of the south jetty. The dike on Cumberland Island, which forms the shore connection of the north jetty, was repaired by the addition of 4,064 cubic yards of brush fascines, the rehandling and placing on top of the brush of 586 cubic yards of stone, the construction of groins composed of sand bags, and the protection of the land side of the dike where Beach Creek strikes it.

The work done during the fiscal year placed the two jetties in very fair condition, but since the completion of the work other portions of these jetties have suffered a slight loss of height, either by settlement or more likely by the washing off of the top stone, and this action may be expected to continue. The Pelican Shoals, on the north of the channel of the main entrance, show a slight change, the inner end shoaling and the outer end deepening.

The flow between the jetties, which originally was strongest along the north jetty, is now very uniformly distributed over the whole width between them, the maximum strength of the same now being found along the south jetty.

The "middle ground" between the jetties continues to move seaward at the usual rate of about 400 feet per year, all of this area having been materially deepened. The tendency to form a channel along the south jetty and thence straight out to sea becomes more marked since the raising of the outer end of the south jetty, the least depth along this line being at present 24 feet at mean low water, increasing to more than 30 feet over most of its length.

The 30-foot curve beyond the bar has not moved seaward at all during the past 12 months. Its form is roughly the arc of a circle, with a mile and a quarter radius, its center being midway of the channel at the outer ends of the jetties. The curve continues until it intersects the 30-foot contour as it originally existed, thus limiting the area into which the eroded material between the jetties has been pushed.

The dike work on the south end of Cumberland Island is at present in excellent condition. The outer beach of Cumberland Island for some 2½ or 3 miles above the south jetty is advancing seaward, so that no immediate trouble is anticipated from encroachment upon this portion of the beach.

On June 30, 1912, the controlling depth in the channel, as indicated by the lighted ranges, was 23 feet at mean low water, but by departing slightly from the lighted range and following the buoyed channel a least depth of 24 feet at mean low water can be carried throughout.

The mean rise and fall of the tide is 6 feet.

The project for the improvement of Cumberland Sound was reported as completed in the Annual Report of the Chief of Engineers for 1905, page 1287.

It is proposed to apply the available balance and additional appropriation recommended to such dredging as may be necessary to maintain an ample channel, easy of navigation, and to make such repairs to the permanent structures as from time to time may become necessary.

As Cumberland Sound merely constitutes the ocean entrance to Fernandina Harbor, the commerce is given under that head.

The effect of the improvement has been to cause a reduction in freight rates of from 25 to 40 per cent.

The project for this improvement will be found in the Annual Report of the Chief of Engineers for 1879, page 792, and the modifications in the Annual Report of the Chief of Engineers for 1891, part 2, page 1566, and report for 1896, part 2, page 1289.

A detailed history of the work of improvement may be obtained by consulting the following documents:

Annual Reports of Chief of Engineers for 1876, part 1, page 459; for 1878, part 1, page 580; for 1883, part 1, page 934; for 1885, part 2, page 1232; for 1888, part 2, page 1054; for 1893, part 2, page 1599; and for 1897, part 2, page 1533; and Senate Executive Document No. 19, Fifty-second Congress, second session, and Senate Document No. 163, Fifty-fifth Congress, first session.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entrance to Cumberland Sound	Senate	[1] 19	Fifty-second	Second		
Do	do	[2] 163	Fifty-fifth	First	1897 [1]	1533–1535
Do					1876 [2]	482
Do					1888 [2]	1052
Do					1889 [2]	1276
Entrance; lower end of sound and Amelia River.					1891 [2]	1560
Entrance to Cumberland Sound					1892 [2]	1288
Do					1893 [2]	1596
Do					1898 [2]	1326
Do					1899 [2]	1597
Do					1902 [2]	1198
Do					1908 [2]	1352
Do					1909 [2]	1356

[1] Does not contain map.

[2] Contains map.

July 1, 1911, balance unexpended	$77,274.95
Amount received from sale of blue prints	3.50
	77,278.45
July 30, 1912, amount expended during fiscal year, for maintenance of improvement	61,893.58
July 1, 1912, balance unexpended	15,384.87
July 1, 1912, outstanding liabilities	499.09
July 1, 1912, balance available	14,885.78
Amount appropriated by river and harbor act approved July 25, 1912	15,000.00
Amount available for fiscal year ending June 30, 1913	29,885.78
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 40,000.00

(See Appendix O 13.)

14. St. Marys River, Ga. and Fla.—This river has its source in the Okefenokee Swamp and flows, first, in a southerly direction and thence due north, thence in a southeasterly direction, and empties into Cumberland Sound, about 3 miles north of Fernandina, Fla. The head of navigation was declared by the act of Congress of December 3, 1880, to be 55 miles above the mouth, at the point where it is crossed by the Atlantic Coast Line Railroad (formerly the Waycross & Florida Railroad), though, as a matter of fact, navigation exists for a considerable distance above this point. The lower portion of the river is a deep tidal estuary with an average width of 1,000 feet for the first 10 miles and 400 feet for the next 20 miles. The river then gradually becomes narrower until it reaches a width of 150 feet at the Atlantic Coast Line Railroad Bridge, 55 miles above the mouth. The mean depth of the river for the first 35 miles is 20 feet at mean low water, only about 2 miles of this distance having a less depth. The controlling depth in this section is 13.5 feet. Between a point 35 miles above the mouth and Kings Ferry, 2 miles beyond, the average depth is 18 feet at mean low water, and from this latter point to the Atlantic Coast Line Railroad Bridge the mean depth decreases until the bridge is reached, where the least depth is 8 feet. The river is a tidal stream, the mean rise and fall of the tide varying from 5.9 feet at the mouth to 1.4 feet at the Atlantic Coast Line Railroad Bridge.

The project of improvement will be found printed as House Executive Document No. 697, Sixty-second Congress, second session, which contains maps of the survey of the river. This project provides for the dredging of a channel 17 feet deep at mean low water and 200 feet wide from its mouth to Crandall, a distance of 12 miles, at an estimated cost of $14,450, and the clearing of the channel of snags and similar obstructions to such point above Kings Ferry, 37 miles from the mouth, as may be practicable with the sum of $5,000, making a total estimated cost of $19,450. This project was adopted by the river and harbor act approved July 25, 1912, which appropriated the total amount of the estimate for carrying out the improvement.

It is proposed to expend the available funds in carrying out the work in accordance with the approved project.

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[1] Exclusive of amount available for fiscal year 1913.

For the calendar year 1910 the annual commerce was estimated to have amounted in value to $515,000. The principal articles handled were lumber, timber, crossties, naval stores, and rice.

Amount appropriated by river and harbor act approved July 25, 1912	$19,450.00
Amount available for fiscal year ending June 30, 1913	19,450.00

(See Appendix O 14.)

15. Removing Sunken Vessels or Craft Obstructing or Endangering Navigation.—There was expended during the fiscal year the sum of $1,614.07 for the removal of dredge *No. 14*, belonging to P. Sanford Ross (Inc.), which was burned and sank in Darien Harbor, Ga., on July 15, 1911.

(See Appendix O 15.)

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

Reports on preliminary examinations and surveys required by the river and harbor act approved March 3, 1909, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. Preliminary examination and survey, respectively, of Oconee, Ocmulgee, and Altamaha Rivers, Ga.—Reports dated June 23, 1909, and July 3, 1911, with map, are printed in House Document No. 443, Sixty-second Congress, second session. A project for maintenance and gradual improvement of these rivers, at the rate of $40,000 per year, is presented.

2. Preliminary examination and survey of St. Marys River, Ga. and Fla.—Reports dated May 22, 1909, and October 28, 1910, with maps, are printed in House Document No. 697, Sixty-second Congress, second session. A plan of improvement, at an estimated cost of $19,450, is presented.

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and surveys required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. Preliminary examination and survey of Cow Head River, Ga.—Reports dated October 25, 1910, and December 31, 1910, with map, are printed in House Document No. 109, Sixty-second Congress, first session. A plan of improvement, at an estimated cost of $6,000, contingent upon local interests contributing one-half (or $3,000) and furnishing the necessary right of way for the proposed cut free of cost to the United States, is presented.

2. Preliminary examination of Darien Harbor, Ga., with a view to securing a depth of 18 feet across the bar.—Report dated September

9, 1910, is printed in House Document No. 277, Sixty-second Congress, second session. The improvement by the United States of this locality in the manner apparently desired is not deemed advisable at the present time.

3. Preliminary examination, with plan and estimate of cost of improvement, of Savannah River and Harbor, Ga., for 2 miles above the upper limits of the city of Savannah, with a view to securing improved navigation, and estimate of the cost of the same, respectively.—Reports dated September 9, 1910, and July 1, 1911, are printed in House Document No. 563, Sixty-second Congress, second session. A plan for improvement at an estimated cost of $140,000, subject to certain local cooperation, is presented.

EXAMINATION MADE IN COMPLIANCE WITH PROVISIONS OF RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Report dated July 17, 1911, on preliminary examination of *Tugaloo River, Ga. and S. C., from its mouth to Fort Madison, S. C.*, required by the river and harbor act approved February 27, 1911, was duly submitted by the district officers. It was reviewed by the Board of Engineers for River and Harbors, pursuant to law, and was transmitted to Congress and printed in House Document No. 676, Sixty-second Congress, second session. The improvement of this locality by the United States in the manner desired is not deemed worthy of being undertaken at the present time.

The local officer was also charged with the duty of making other preliminary examinations and surveys provided for by the river and harbor acts approved June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. Waterways from Louisville to Savannah, including cut-off or canal from Ogeechee River to Savannah River or Harbor, with a view to providing a more direct route between said cities than that afforded by existing channels.

2. Frederica River at or near Fort Frederica, Ga.

3. Satilla River above Burnt Fort, Ga.

4. Darien Harbor and Boboy Bar, Ga., with a view to securing the same depth on the bar as in the harbor, namely, 12 feet at mean low water.

IMPROVEMENT OF RIVERS AND HARBORS IN THE JACKSONVILLE, FLA., DISTRICT.

This district was in the charge of Capt. George R. Spalding, Corps of Engineers, to July 20, 1911, and in the charge of Capt. J. R. Slattery, Corps of Engineers, since that date. Division engineer, Col. Dan C. Kingman, Corps of Engineers.

St. Johns River, Fla.—This river has its source in the Halpatiokee swamps, which lie south of Saw Grass Lake and northeast of Lake Okechobee. The general direction of flow is north until a point is reached a few miles north of Jacksonville, from which point the general direction of flow becomes east until the river empties into the Atlantic Ocean at Mayport, Fla. The total length of the river from Saw Grass Lake to its mouth is 280 miles. For purposes of improvement the river has been divided into four reaches, known, respectively, as—

The St. Johns River, Fla., general improvement.
The St. Johns River, Fla., opposite the city of Jacksonville.
The St. Johns River, Jacksonville to Palatka.
The St. Johns River, Fla., Palatka to Lake Harney.

1. *The St. Johns River, Fla., general improvement.*—This work includes the improvement of the bar at the river mouth and the improvement of the channel from the bar to Jacksonville, a distance of 27.5 miles. The entrance to this river is 21.7 statute miles from the entrance to Fernandina Harbor, Fla., and 122 statute miles from the entrance to Savannah River, Ga. Before improvement there was a varying channel across the bar, sometimes 5, sometimes 7 feet deep, shifting in location through a north and south range of 1 mile. Between the bar and Jacksonville the channel had a least mean low-water depth (at Dames Point) of 11.5 feet and was about 150 feet wide.

The range of tide is 5.22 feet at the bar, 4.3 feet at Mayport, 1.8 feet at Dames Point, and 0.8 foot at Jacksonville.

The original project for improvement, adopted in 1879, contemplated a channel 15 feet deep at mean low water over the bar. This was to be obtained by dredging and building training walls in the river and by building two stone jetties, converging upon the bar, 1,600 feet apart at their outer ends. Under this project the sum of $1,417,000 was expended. As a result the bar channel was fixed and deepened to 13 feet.

When the permanent increase in depth over the bar had been secured, a project was submitted in 1892 contemplating securing a channel 18 feet deep at mean low water from the bar to Jacksonville. This project was carried through by the War Department with funds furnished by the county of Duval. It was completed in 1894. In 1896 a project was adopted providing for a channel from Jacksonville to the ocean 24 feet deep at mean low water and 300 feet wide.

The amount expended on original and modified projects prior to operations on existing project was $3,994,394.89, of which $175,175.99 was for construction of a seagoing dredge and $543,398.52 was for work of maintenance.

With the expenditure for work of maintenance the work of restoring the jetties to their original heights was completed, excepting the middle portion of the north jetty, which is below its effective height, and the channel through Mile Point Cut, White Shells Cut, Fulton Cut, Clapboard Creek Cut, and St. Charles Creek Cut was restored to the original depth of 24 feet for a least width of 150 feet. During the course of maintenance dredging in St. Charles Creek Cut was done to a depth of 30 feet, as called for under the new project. The project was nearly completed, and contracts were in force under it when the existing project was adopted.

The existing project was adopted by the river and harbor act of June 25, 1910, and provides for a channel 30 feet deep and 300 feet wide from Jacksonville to the ocean, following generally the lines of the 24-foot channel, increasing in width to as much as 600 feet at the bends and through the jetties, as outlined in House Document

No. 611, Sixty-first Congress, second session (with maps). The total estimated cost of the work is $2,852,000, which includes the widening of the channel opposite Mayport to 800 feet in excess of the channel width to a depth of 27 feet, to provide an anchorage basin for vessels awaiting favorable weather.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entrance	House	[1] 1	Thirty-third	First		
Jacksonville to bar					1872 [1]	672-677
Entrance					1878 [1]	581-586
Do					1879 [2]	767-792
Jacksonville to ocean	House	546	Fifty-third	Third	1895 [2]	1586-1604

[1] No maps.

[2] Contains maps.

No modification has been made in the existing project.

During the fiscal year a channel 150 feet wide and 30 feet deep, commenced during the preceding year, was completed through the Mayport Cut. The channel at Dames Point has been widened between 20 and 300 feet, giving a channel about this point 25.3 feet to 30 feet deep. The depth of 30 feet was obtained except where rock was encountered. The channel in the New Berlin Cut was completed to a depth of 30 feet and width of 300 feet for a distance of 762 feet measured from the upper end of the cut, and a depth of 30 feet and width of 150 feet throughout the rest of this cut; the channel in Browns Creek Cut was dredged to a depth of 30 feet and width of 150 feet for a distance of 4,200 feet measured from the upper end.

At the beginning of the fiscal year the Mayport anchorage basin was full depth, except at the oyster bank lying in the lower portion of the basin opposite Pilot Town, in the triangle formed by lines marking the northern side of the basin and the northern side of the Pilot Town Cut. This oyster bed was almost entirely removed during the year, the shell being used to construct the core of a protecting wall commencing at Clapboard Creek Cut and extending thence toward Browns Creek. Five thousand five hundred and forty-five feet of core wall was thus built. The wall was capped with heavy stone for 3,000 feet of this distance.

The rock in Trout Creek Cut was broken up for a width of 150 feet (half the width of the channel) for almost the entire length of the cut and was removed for a length of 300 feet at the upper end of the cut, full depth of 30 feet being obtained for this distance for a width of 150 feet. As much of the rock as was suitable was used in building a protecting wall commencing at Browns Creek and extending thence toward New Berlin; 100 feet of wall was thus built.

Work was carried on at Mile Point, Wards Bank, Jetty and Bar Cuts by the Government dredges *St. Johns* and *Key West.* The former dredge worked on this improvement the entire year, except when undergoing repairs, and the latter for about four and one-half months. As a result of the work of these two dredges, the depths in the straight channel across the bar were increased from 22.8 feet to 25.2 feet over a width of 500 feet (a deeper natural channel exists to the north of this depth); full depth (30) was obtained for a width of 500 feet throughout the Jetty Cut, and for a width of 100 feet through Wards Bank Cut; the channel through Mile Point Cut was restored to a depth of 24 feet but shoaled again to 22.5 feet before the close of the year.

The expenditure during the year amounted to $228,662.03, of which amount the sum of $45,815.18 was for maintenance work at Mile Point; and the sum of $256.83 was received from sales, and the sum of $10,338.44 was received for rent of the dredge *Jacksonville*.

The sum of $669,157.47 was expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, of which amount the sum of $118,468.34 was for maintenance; and the sum of $296.40 was received from sales, and $41,502.76 was received for rent of dredges *St. Johns* and *Jacksonville*.

The work in progress is under continuing-contract appropriations. The balance of the authorization remaining to be appropriated is $150,000.

The existing project was about 23 per cent completed on June 30, 1912. The maximum draft that can be carried at mean low water is 21 feet, shoaling having occurred in Fulton and Brown Creek Cuts to this extent. The mean rise of the tide at Fulton Cut is 2.9 feet and at Browns Creek Cut is 2.8 feet. Some shoaling has also occurred in the Mayport, New Berlin, and Dames Point Cuts, reducing the depths in these cuts to 23.2, 22.7, and 23.7 feet, respectively.

The commerce for the fiscal year 1911 amounted to 1,790,498 short tons, valued at $56,865,789, consisting of coal, cement, fertilizers, fertilizer materials, fruits, lumber, merchandise, phosphate, oils, steel rails, vegetables, etc. The increase in tonnage over the preceding year amounted to only 1.5 per cent. One steamer line was established during the year, an intracoastal line to Fort Pierce, and one line was abandoned, the Roome Line to Miami.

The post-office receipts during 1911 were $476,299.27 and the bank clearings $146,740,819.23.

Were it not for the improvement, frieight rates from Florida to northern points would be 50 per cent greater than they are.

The work on previous projects has resulted in establishing favorable rates for this port, which permit it to reach far into the Middle West. In its incomplete state the present project can not be said to have had any effect on freight rates nor on the establishment of new business, though in anticipation of deeper water the farseeing men in the city are striving to have adequate terminals to handle the large business which is expected with the completion of the project.

It is proposed to utilize the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914 ($700,000), in entering into a contract for the completion of the rock removal from Trout Creek cut, utilizing the rock for the construction of training walls and shore protection; in entering into contract for removal of rock from Dames Point; in entering into a contract for dredging between Jacksonville and Dames Point; in continuing the operation of Government plant in the lower portion of the river and in maintenance of the jetties. The growing commerce of this port and the constantly increasing draft of ships loading or desiring to load at this port makes it of the utmost importance that the 30-foot channel be completed not later than July 1, 1915, and the above estimate is submitted with this end in view. These funds are necessary in order to permit the execution of advantageous contracts for completing the remainder of the work to be done by contract and to provide for the operation of the Government plant until June 30, 1914. These expenditures are necessary in order to make the improvement available.

July 1, 1911, balance unexpended		$309,443.81
Received from rents and sales		10,595.27
		320,039.08
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$182,846.85	
For maintenance of improvement	45,815.18	
		228,662.03
July 1, 1912, balance unexpended		91,377.05
July 1, 1912, outstanding liabilities		65,358.96
July 1, 1912, balance available		26,018.09
Amount appropriated by river and harbor act approved July 25, 1912		300,000.00
Amount appropriated by sundry civil act approved Aug. 24, 1912		350,000.00
Amount available for fiscal year ending June 30, 1913		676,018.09
July 1, 1912, amount covered by uncompleted contracts		460,358.65
Amount of continuing contract authorization, act of Feb. 27, 1911		500,000.00
Amount appropriated under such authorization		350,000.00
Amount yet to be appropriated		150,000.00
Amount (estimated) required to be appropriated for completion of existing project		[1] 1,477,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1][2] 700,000.00

(See Appendix P 1.)

2. *St. Johns River, Fla., opposite the city of Jacksonville.*—The section of the river covered by this project lies between the Florida East Coast Railroad bridge and Hogans Creek, and is 1.2 miles in length. The lower end of the section is 27 miles from the mouth of the river. Before improvement ample depths existed in this portion of the river through a channel of considerable width, but the pierhead line was established some distance shoreward of this deep-water channel, and between said channel and the pierhead line there was a rock reef with only from 14 to 15 feet of water over it at mean low water. For description of the St. Johns River see page 524.

The original project, which is also the existing project, was adopted by the river and harbor act of March 2, 1907, and provides for dredging to a depth of 24 feet at mean low water the area lying between the 24-foot curve in the river and the pierhead line between the Florida East Coast Railroad bridge and Hogans Creek, at an estimated cost of $371,000; increased June 30, 1909, to $586,300. This project is based on report of preliminary examination printed in House Document No. 663, Fifty-ninth Congress, first session. (No maps.)

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[1] Exclusive of amount available for fiscal year 1913.

[2] Of this amount, $150,000 is for continuing-contract work authorized by the act of 1911.

No modification has been made in the existing project.

Expenditures during the year amounted to $49,805.39, with which the area from Catherine Street to Hogans Creek was dredged to full depth, completing the project. The length of this work was 1,320 feet. Twelve thousand eight hundred and forty cubic yards of rock were removed. The rock was used in building training walls in the lower river.

There had been expended under this project up to the close of the fiscal year ending June 30, 1912, $473,165.57, none of which was for maintenance. This project is completed. As a result of the improvement 24 feet of water is available between the pierhead line and deep water in the river all along the city's water front from the Florida East Coast Railroad bridge to Hogans Creek.

The average rise and fall of tide is 0.8 foot, although under special conditions the river sometimes rises to a height of 3 feet above mean low water.

For commercial statistics and other general information, reference is made to the current report and summary on improvement of St. Johns River, Fla.

The work so far completed has not had any effect on freight rates.

No funds are required for the year 1914, as no maintenance operations are likely to be needed that soon.

July 1, 1911, balance unexpended	$63,139.82
June 30, 1912, amount expended during fiscal year, for works of improvement	49,805.39
July 1, 1912, balance unexpended	13,334.43
July 1, 1912, outstanding liabilities	13,334.43

(See Appendix P 2.)

3. *St. Johns River, Fla., Jacksonville to Palatka.*—This improvement previous to the passage of the river and harbor act of June 25, 1910, was reported upon under the title "Improvement of St. Johns River at Orange Mills Flats, Fla."

For general description of the St. Johns River, see page 524.

The length of this section of the river is 55 miles.

Before improvement there were four shoals between Tocoi and Palatka. These were Tocoi Shoal, with a least depth of 11.1 feet; Racy Point Shoal, with a least depth of 9.8 feet; and Forresters Point Shoal, with a least depth of 11.6 feet.

The original project, which is likewise the existing project, was adopted March 3, 1899, and contemplated dredging a channel 200 feet wide and 13 feet deep through the shoals named, at an estimated cost (increased in 1906) of $185,000. This project is based upon a report of an examination and survey printed in House Document No. 523, Fifty-fifth Congress, second session. (No maps.)

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Orange Mills Flats	House	[1] 240	Fifty-first	Second	1891	1666–1670
Do	do	[1] 347	Fifty-third	Third	1895	1560–1564
Do					1900 [2]	1974–1978

[1] No maps.

[2] Contains maps.

No modification has been made in the existing project.

The amount expended during the fiscal year amounted to $2,488.96, which was used in redredging the channel through Tocoi Shoal, where shoaling had occurred. A cut 60 feet wide and 9,590 feet long was completed to a depth of 15 feet.

The amount expended on the work of the existing project up to the close of the fiscal year ending June 30, 1912, was $164,040, of which amount $13,779.75 was for work of maintenance.

The project was 80 per cent completed at the close of the fiscal year. The work done has been of material benefit to navigation.

The maximum draft that could be carried over the shoalest part of the improvement June 30, 1912, was 13 feet. The widths of the 13-foot channels through the shoals are as follows:

	Feet.
Tocoi Shoals	110
Racey Point Shoal	180
Orange Mills Flats	200
Forresters Point Shoal	160

The usual variation of level of water surface due to freshets is 3 feet. The mean range of tide is 0.9 foot.

The distance from Jacksonville to Palatka is 55 miles.

The river is navigable to Lake Washington, a distance of 276 miles. The head of steamboat navigation at present is Lake Poinsett, 252 miles from the mouth of the river.

The existence of the St. Johns waterway has probably had an important effect in keeping down freight rates, but the increase of the channel to 13 feet has not, as far as known, caused any changes in rates.

This channel, however, permits light-draft schooners to load at Palatka with cypress lumber from the large mills at that place, and a diminution in depth in the channel, requiring lightering of this material to Jacksonville, would, it is thought, raise the freight rates.

The commerce for the year amounted to 198,293 short tons, valued at $7,636,633, consisting principally of crate material, fertilizers, fruit, grain, groceries, logs, lumber, merchandise, naval stores and vegetables. The commerce increased 19.3 per cent during the year.

It is proposed to apply the amount required for expenditure in fiscal year ending June 30, 1914, to dredging in furtherance of existing project and for maintenance.

The proposed work is for extending the benefits.

July 1, 1911, balance unexpended	$2,488.96
June 30. 1912, amount expended during fiscal year, for maintenance of improvement	2,488.96
Amount appropriated by river and harbor act approved July 25, 1912	15,000.00
Amount available for fiscal year ending June 30, 1913	15,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 17,600.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 19,600.00

(See Appendix P 3.)

4. St. Johns River, Fla., Palatka to Lake Harney.—For general description of the St. John River, see page 524. The length of this section of the river is 115 miles. Palatka, at the lower end of this section, is 83 miles from the mouth of the river. Before improvement there was a shifting channel through Volusia Bar with depths of from 3.5 to 4.5 feet at mean low-water stages. A number of sharp bends also made navigation difficult.

Prior to the passage of the river and harbor act of June 25, 1910, only that portion of this stretch of river between Lake George and Lake Monroe was under improvement and this improvement was reported upon under the title "Improvement of Volusia Bar, Fla." The original project for this improvement, adopted in 1879 and modified in 1887, provided for the construction of two converging jetties and for dredging at Volusia Bar, in order to secure a depth of 5 feet at mean low water at an estimated cost of $25,000.

The project was completed in 1887, and additional work required is for maintenance. As shoaling has continued, it has been found necessary to dredge from time to time in order to maintain the required depth.

The total amount expended on the original and modified projects was $50,838, of which $25,838 was for work of maintenance.

The existing project, adopted by the river and harbor act of June 25, 1910, contemplates securing a channel 8 feet deep and 100 feet wide from Palatka to Sanford, and 5 feet deep and 100 feet wide from Sanford to Lake Harney, in accordance with the report published in House Document No. 1111, Sixtieth Congress, second session, at an estimated cost of $129,600, with $6,000 annually for maintenance. (Contains maps.)

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Lake George to Lake Monroe					1879 [2]	795-798
Lake Monroe to Lake Harney	Senate	65	Forty-eighth	First	1884 [2]	1138-1142
Jacksonville to Sanford [3]	House	240	Fifty-first	Second	1891	1666-1674

[1] Exclusive of amount available for fiscal year 1913. [2] Contains maps. [3] No maps.

No modification has been made in the existing project.

During the year cut-off channels 10 feet deep and 110 feet wide were dredged at Florida and Coxetters Bends, 960 and 990 feet long, respectively. Channels of the dimensions given were also dredged through the shoals enumerated below:

Location of shoal.	Depth of dredged channel.	Width.	Length.
	Feet.	*Feet.*	*Feet.*
Fort Florida, 184 miles above Palatka	10	110	1,800
Lake Monroe, upper bar, 94 miles above Palatka	10	110	1,900
Geneva Ferry, lower shoal, 4.9 miles above Sanford	6	110	970
Geneva Ferry, upper shoal, 5.1 miles above Sanford	6	110	1,300
Geigers Shoal, 10.6 miles above Sanford	6	110	1,300
Lemon Bluff, 13 miles above Sanford	6	110	1,100
Lake Harney, lower bar, 21.9 miles above Sanford	5.2	110	2,700

Between the upper and lower bar or shoals at Geneva Ferry a cut-off 6 feet deep and 100 feet wide was dredged across the sharp bend leading through Lake Jessup, by Orange County, incident to the construction of a bridge at Geneva Ferry, with the approval of the War Department.

Snagging operations were carried on by the U. S. power boat *Captain Maguire*, accomplishing the removal of 76 snags, 19 logs, and 489 overhanging trees.

The total expenditure during the fiscal year amounted to $34,498.64.

The amount expended on existing project up to the close of the fiscal year ending June 30, 1912, was $62,055.42, none of which was for maintenance.

The project is 50 per cent completed. The result has been to make navigation materially easier through the improved portions.

The maximum draft that can be carried at mean low stage of river is 6 feet over the unimproved portions below Sanford and 5.2 feet above Sanford.

The usual variation of water level is 2 feet; the extreme variation 3½ to 5 feet. This section has been improved for its entire length, 115 miles.

The river is navigable, in fact, to Lake Washington, 276 miles above the mouth.

The commerce for the year 1911 amounted to 203,353 short tons, an increase of 77.8 per cent over the tonnage for 1910, valued at $4,548,657, and consisted principally of crate material, fertilizers, fruit, grain, groceries, logs, naval stores, and merchandise. About 75 per cent of the commerce consists of logs. Of the commerce of the river 99,166 tons comes from the Oklawaha River and passes down the St. Johns, only from the mouth of the Oklawaha to Palatka, a distance of 25 miles.

Towns along the river enjoy materially lower freight rates than points not located on the river but equal distances from Jacksonville. The differences frequently amount to 50 per cent.

It is proposed to expend the amount required for expenditure in fiscal year ending June 30, 1914, in continuing the improvement by dredging in furtherence of the existing project and in maintenance. The additional work proposed is for the purpose of extension of benefits.

July 1, 1911, balance unexpended	$34, 848. 22
Receipts from sales	4. 45
	34, 847. 67
June 30, 1912, amount expended during fiscal year, for works of improvement	34, 498. 64
July 1, 1912, balance unexpended	349. 03
July 1, 1912, outstanding liabilities	349. 03
Amount appropriated by river and harbor act approved July 25, 1912	25, 000. 00
Amount available for fiscal year ending June 30, 1913	25, 000. 00
Amount (estimated) required to be appropriated for completion of existing project	[1] 42, 200. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 42, 200. 00

(See Appendix P 4.)

5. *Oklawaha River, Fla.*—This river rises in Lake Griffin, in Lake County, Fla., flows in a northerly direction, and empties into the St. Johns River about 20 miles above Palatka. The river is narrow, extremely tortuous, and obstructed by shoals. Projects for improvement have embraced the whole river. Before improvement the river was obstructed by snags, accumulations of drift, overhanging trees, and many sharp bends, many of which still remain to be improved. The available depths at ordinary low-water stage to Silver Springs was 4 feet and to Leesburg 2 feet. The total length of the river is 86 miles.

The original project, which is likewise the existing project, was adopted in 1891, and provided for cleaning the river of obstructions so as to give a navigable channel [illegible] feet deep at mean low-water stage from the mouth to Leesburg, a distance of 94 miles, at an estimated cost of $26,000. The project was modified by the river and harbor act of March 2, 1907, to provide for removing obstructions and deepening the channel so as to afford a depth of 6 feet from the mouth of the river to the head of Silver Springs Run, at an estimated additional cost of $15,000. The river and harbor act approved June 25, 1910, further modified the project so as to provide for the maintenance of the levels in the lakes at the head of the stream. The project is based on plans submitted in House Document No. 782, Fifty-ninth Congress, first session. (No maps.)

References to examination or survey reports and plans or maps not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Lake Griffin to mouth					1889 [2]	1360-1364
Do					1891 [3]	1620-1627

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[1] Exclusive of amount available for fiscal year 1913. [2] No maps. [3] Contains maps.

The existing project is to secure a channel 6 feet deep from the mouth of the river to the head of Silver Springs Run, a channel 4 feet deep from the mouth of Silver Springs Run to Leesburg, and to maintain the levels of the lakes at the head of the river.

During the year a dam was built across the old river bed at the upper end of the Gores Creek Cut-off and 47 snags were removed. It was decided to build a lock and dam near the upper end of the canal dug by private enterprise between Moss Bluff and a point 10 miles above the mouth of Silver Springs Run, as recommended by the Board of Engineers officers appointed April 5, 1911. Expenditures during the year amounted to $1,986.36, which was all used in new work.

The amount expended on work under the existing project up to the close of the fiscal year ending June 30, 1912, was $47,516.36, of which amount $24,914.07 was applied to maintenance of improvement.

The original project is believed to be about 55 per cent completed, but owing to the fact that logs and snags are carried by freshets into the stream or moved from the sides into the channel more work will have to be done than can be estimated from examination or survey.

During freshets the water sometimes rises to a height of 4 feet above its normal stage. As a general result of the work heretofore done there is a well-cleared channel 6 feet deep for the first 32 miles of the stream, a practicable channel 4 feet deep at ordinary low stages of the river to Silver Springs Run, 53 miles from the St. Johns River, and a channel 3 feet deep at ordinary stage of water to Leesburg, 94 miles from the mouth. Leesburg is the head of steamboat navigation. Navigation in the upper river is much obstructed by hyacinths and eel grass.

The commerce for the fiscal year amounted to 102,206 short tons, valued at $1,055,464, consisting principally of logs, merchandise, fruits, and naval stores. Logs make up 77 per cent of the commerce.

The river is so tortuous and the uncertainty of navigation so great that the improvement has had no appreciable effect upon freight rates. There exists a large amount of produce that would, without much doubt, be shipped over the river if a better and more certain channel existed. A better channel would result in the establishment of regular boat lines which would probably materially lower freight rates. During the winter months excursion steamers ply between Palatka and Silver Springs, as the river has a very considerable scenic value. Two steamers and five power boats ply the river the entire year, carrying passengers and general freight. There are over 75 launches on the river engaged in towing lighters and rafts and in general traffic.

No additional funds are required, as the river is now being surveyed in accordance with a provision in the river and harbor act approved June 25, 1910. As soon as the survey is completed comprehensive plans will be submitted for the further improvement of the river, together with estimates for funds based on these plans.

July 1, 1911, balance unexpended	$18,180.00
June 30, 1912, amount expended during fiscal year, for works of improvement	1,986.36

July 1, 1912, balance unexpended	$16,193.64
Amount appropriated by river and harbor act approved July 25, 1912	15,000.00
Amount available for fiscal year ending June 30, 1913	31,193.64

(See Appendix P 5.)

6. *Indian River, Fla.*—Indian River is a shallow sheet of water on the east coast of Florida, lying between the mainland and the Keys bordering the coast and extending from a point a slight distance north of Titusville to Jupiter Inlet, a distance of approximately 140 miles. It has an average width of about a mile and a half. It is not, accurately speaking, a river, but rather a tidal sound. It forms a part of the system of intracoastal canals along the eastern coast of Florida. Before improvement the ruling depth was 2½ feet.

The original project, which is the existing project, was adopted in 1891, and provides for a continuous channel between Goat Creek and Jupiter Inlet 5 feet deep at mean low water and at least 75 feet wide in the straight reaches, with as much greater width as may be required in the turns. The estimated cost is $44,000. Under date of July 11, 1911, the estimated cost was increased $20,000, making a total estimated cost of $64,000. The project is based upon the report printed in House Document No. 168, Fifty-first Congress, second session (no maps).

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
North end					1882 [1]	1229-1243
St. Johns River near mouth to Lake Worth.					1885 [1]	1291-1293
North end [1]	Senate	83	Forty-seventh	First	1884	1143-1144
Indian River to Mosquito Lagoon	do	[1] 65	Forty-eighth	do		
Hanlover to Gilberts Bar					1887 [1]	1261
Negro Out	Senate	3	Fifty-third	Second	1894	1227-1230
Fort Pierce to Sewalls Point	House	[1] 75	Sixty-first	First		

[1] No maps.

No modification has been made of the existing project.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, including expenditures on Jupiter Inlet, $3,127.15, was $76,031.72, of which $39,973.60 was for work of maintenance. No modification has ever been made in the original project.

During the year a channel 35 feet wide, 5 feet deep, and 7,450 feet long was dredged between Great Pocket and Pecks Lake, and a channel 5 feet deep, 50 feet wide, and 650 feet long was also dredged through a shoal at the entrance to Great Pocket. The total cost of this work was $13,550.47. This work most probably comes under the head of maintenance.

The project is about 60 per cent completed. As a result of the work done the project has been completed from Goat Creek to St. Lucie Inlet, a distance of 51 miles, and a portion of the projected work has been done between St. Lucie Inlet and Jupiter Inlet, a distance of 16 miles. St. Lucie Inlet is the result of an artificial opening made into the ocean in 1892, after the project for this improvement was adopted. The inlet widened under natural influences and caused the sound inside to so fill with sand that the channel has been at times obliterated, and attempts at maintenance have been unsuccessful. To obviate these conditions the channel between Great Pocket and Pecks Lake was dug.

The maximum draft that can be carried over the shoalest part of the locality under improvement is 4 feet, in the vicinity of St. Lucie Inlet.

The range of tide in the vicinity of the inlets is 2 feet; elsewhere the tide is negligible. The water surface is raised or lowered by strong winds as much as 3 feet, irrespective of the tide.

The distance between Goat Creek and Jupiter Inlet is 77 miles.

The commerce of this locality consists mainly of fruits, vegetables, fish fertilizers, gasoline, crate material, hay, grain, lumber, and general merchandise. In 1911 it amounted to 11,593 short tons, valued at $609,734.

So far as has been ascertained, the improvement has had no effect on freight rates.

The amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied to continuing work under the project and in maintenance of channel already dredged. The work proposed is for the purpose of extension of benefits.

July 1, 1911, balance unexpended	$13,550.47
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	13,550.47
Amount (estimated) required to be appropriated for completion of existing project	[1] 20,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 22,000.00

(See Appendix P 6.)

7. *Harbor at Miami, Biscayne Bay, Fla.*—Biscayne Bay is a shallow sheet of water lying between the Florida Keys and the mainland. It is some 36 miles long and has an average width of about 6 miles. The city of Miami, Fla., the only town of consequence on the bay, lies about halfway between the head of the bay and the mouth, and is 360 miles south of Jacksonville, and about 160 miles north of the harbor of Key West.

Before improvement this bay was navigable at mean low water for boats drawing less than 3 feet of water. There was a channel, excavated at private expense, 12.5 miles long with a least depth of 10.5 feet at mean low water, from Miami to the Atlantic Ocean, near Cape Florida.

The river and harbor act of June 13, 1902, adopted in part a plan proposed by a board of engineer officers appointed in accordance with a provision in the river and harbor act of March 3, 1899. This plan contemplated a channel 18 feet deep from the wharves at Miami to the sea by way of a line entering the sea at a point about 4,000 feet north of Norris Cut, and a refuge basin of same depth 1,200 feet long and 400 feet wide, in some suitable place, this channel to be protected by one or two jetties, as might be found necessary. The estimated cost of the entire improvement was $1,493,743. (See H. Doc. No. 662, 56th Cong., 1st sess.) The act of 1902 appropriated and authorized an expenditure of $300,000 for part of this work and provided that the Florida East Coast Railway Co. should construct at its own expense a basin 1,600 feet long and 500 feet wide adjacent to the wharves at Miami, and the channel from said basin to the east side of the proposed refuge basin on the east side of the bay; that the amounts appropriated and authorized by Congress should be expended in constructing and protecting the portion of the channel extending to the sea from the terminus of the channel to be constructed by the railway company, of such approximately uniform depth and of such widths as would best serve the interests of navigation and as could be constructed with the funds appropriated and authorized. The act further provided that before any part of the appropriation should be expended the said railway company should enter into a contract with the United States for the performance of its part of the work.

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[1] Exclusive of balance unexpended July 1, 1912.

The act of March 2, 1907, modified the project by prescribing a width of 100 feet for the dredged channel, and by providing for a jetty on the southern side of the entrance. The total estimated cost of the work authorized by Congress is $546,000, all of which has been appropriated.

The amount expended on work under original project as modified in preceding paragraph up to close of the fiscal year ending June 30, 1912, was $560,436.68, of which $11,953.33 was for emergency work for maintenance by the construction of shore revetment. Of the amount expended $1.50 was received from sales.

The river and harbor act approved July 25, 1912, modified this project in accordance with plan printed in House Document No. 554, Sixty-second Congress, second session (with map), so as to provide for a channel through the cut between the bay and the ocean, 300 feet wide and 20 feet deep at mean low water, for a refuge basin to a depth of 18 feet at mean low water, and for extending the jetties, and for the construction of a dredging plant, all at a total estimated cost of $400,000.

The act further provides that no work shall be done by the United States on said project until the Secretary of War is satisfied that the portion of the work contemplated in this project to be done by the Florida East Coast Railway Co. will be promptly completed, nor until the Secretary of War is satisfied that suitable terminal facilities will be provided as contemplated by paragraph 8 of the report of the Board of Engineers for Rivers and Harbors as set forth on page 15 of said Document No. 554, Sixty-second Congress, second session (with maps).

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entrance to Biscayne Bay [1]	House	343	Fifty-third	Third	1896	1567 et seq.
Biscayne Bay [2]	do	295	Fifty-fourth	Second	1897	1589-1596
Miami to ocean by Norris Cut, Bear Cut, and Cape Florida entrance.[2]	do	662	Fifty-sixth	First	1900	1986-2012

[1] No maps.

[2] Contains maps.

The existing project contemplates a channel from the ocean to the bay, 300 feet wide and 20 feet deep at mean low water, protected by jetties on both sides of the channel, somewhat longer than the existing jetties; a refuge basin at a suitable location inside the western end of this cut, 18 feet deep at mean low water, 1,200 feet long, and 400 feet wide; and a channel from said refuge basin to the wharves at Miami 18 feet deep and not less than 85 feet nor more than 100 feet wide at mean low water, the latter to be dredged by the Florida East Coast Railway Co. without expense to the United States. The carrying out of the portion of this work to be performed by the United States is contingent upon assurance that the Florida East Coast Railway Co. will do its portion of the work and that the city of Miami will provide suitable public terminals.

No work has been done during the year under the present existing project. The following, all of which was for new work, was done under the project as it stood before modification by the river and harbor act of July 25, 1912.

The channel through the cut was widened from 85 feet to 110 feet, the length of the cut thus made being 675 feet, extending from the 18-foot curve in the ocean to the 18-foot curve near the inner end of the jetties. The depths obtained were 18 and 19 feet at mean low water, but this channel immediately filled up again. The shore to the north of the north jetty was also protected by means of riprap for a distance of 290 feet.

No expenditures have been made under the existing project.

The maximum draft that could be carried through this cut into Biscayne Bay was 9 feet.

Up to the present time no practicable channel has been secured, as the channels dredged have filled up at the outer ends within a few months after their completion. The expenditures, therefore, have not afforded any increased facilities or advantages up to the present time.

The mean range of tide in the bay is 1 foot; at New Cut, where work by the Government is in progress, it is 2.2 feet.

The amount of water-borne commerce carried on at Miami during 1911 was 219,375 short tons, valued at $3,993,890, an increase over the commerce of 1910 of 40 per cent. The commerce consisted principally of fruit, canned goods, merchandise, groceries, crude oil, and sand.

The freight rates have been lowered 50 per cent.

It is proposed to use the amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, in extending the jetties and in dredging by Government plant to be built with funds now available. In addition to this cash appropriation, a continuing-contract authorization in amount sufficient to complete the project, or at least to finish the jetties, is desirable. Such appropriations would operate the Government plant and permit the execution of contracts for all rock work necessary in extending the jetties. The cost of work will be materially increased if it should be necessary to secure it in several lots instead of one large block. The expenditures are necessary in order to make the improvement available.

July 1, 1911, balance unexpended		$22,926.50
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$20,407.67	
For maintenance of improvement	2,194.76	
		22,602.43
July 1, 1912, balance unexpended		324.07
Amount appropriated by river and harbor act approved July 25, 1912		100,000.00
Amount available for fiscal year ending June 30, 1913		100,324.07
Amount (estimated) required to be appropriated for completion of existing project		[1]300,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[1]145,000.00

(See Appendix P 7.)

8. *Harbor at Key West, Fla., and entrance thereto.*—The harbor of Key West consists of a pocket in the reef, protected on the eastern side by the island of Key West and the submerged reef and on the northern and western sides by the submerged reef. Considering the harbor as commencing near Fort Taylor and extending to the northern end of Man-of-War Harbor, its approximate dimensions become 2 miles by one-quarter mile. The lower end of the harbor opposite the island proper accommodates at mean low water vessels drawing about 27 feet. The water becomes shoaler toward the northern end of Man-of-War Harbor, where vessels could not be accommodated drawing more than 22 feet. The entrance referred to herein is the northwest channel. In addition to this channel there are four other channels leading to the harbor, generally known as the southwest channel, the main ship channel, the southeast channel, and the west channel. The main ship channel at mean low water will accommodate vessels drawing 27 feet and the west channel 30 feet. All of these channels are somewhat obstructed by coral heads, so that ships of as great draft as stated can only be brought in by pilots thoroughly familiar with the said entrances. The northeast channel before improvement afforded a depth of about 10.5 feet at mean low water over the northwest bar. In addition to the harbor proper a large anchorage area, affording a depth of about 34 feet, lies in a southwesterly direction from Whitehead Point and distant about 2 miles therefrom.

Key West is 516 statute miles from Jacksonville and 644 statute miles from New Orleans and 246 statute miles from Tampa.

The original project, adopted in 1889, contemplated a channel through the northwest passage 17 feet deep at mean low water. This was to be secured by building two stone jetties, one to the northwest and one to the west of the channel, converging toward the bar, and by dredging if necessary. The estimated cost of the east jetty was $500,000.

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[1] Exclusive of amount available for fiscal year 1913.

This project was based upon the report published in House Ex. Document No. 145, Fiftieth Congress, second session. (No maps.)

The act of March 2, 1907, modified the project by authorizing continuance of work on the existing jetties or the building of training walls, in the discretion of the Secretary of War. No estimate of cost has been adopted for this additional work.

The river and harbor act approved July 25, 1912, further modified this project so as to provide also for the deepening and widening of the main ship channel at the entrance and at Triangle Shoals, so as to afford a channel 30 feet deep and 300 feet wide, and for removing shoals in the anchorage in accordance with report submitted in House Document No. 706, Sixty-second Congress, second session (contains maps), at an estimated cost of $48,000.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Northwest entrance					1868 [1]	821
Harbor and northwest entrance [1]	Senate	[3] 11	Forty-seventh	First	1882	1314–1316
Northwest entrance					1887 [2]	1221–1234
Ship channel [1]	House	567	Fifty-eighth	Second	1904	1738–1748
Harbor	do	[1] 970	Sixtieth	First		

[1] No maps. [2] Contains maps. [3] Executive document.

The existing project as modified is to deepen and widen the main ship channel at the entrance and at Triangle Shoals so as to afford a channel 30 feet deep and 300 feet wide at mean low water; to remove the shoals in the anchorage and to maintain a channel 17 feet deep and of sufficient width through the northwest passage.

During the fiscal year the dredge *Key West* worked on the northwest channel from December 14, 1911, to April 23, 1912. A total of 240,441 cubic yards of material was removed, at a cost of $23,185.10, from the northwest bar, restoring the channel to a depth of 17 feet and a width of 200 feet.

At the close of the fiscal year the sum of $736,058.21 had been expended on the project as it stood before it was modified by the river and harbor act approved July 25, 1912, of which amount the sum of $47,874.15 was applied to removal of reefs from the main ship channel and to the maintenance of the improvement.

A channel 17 feet deep and 200 feet wide at mean low water exists through the northwest passage.

The jetties are about 60 per cent completed. Nothing has been done toward removing coral heads from main ship channel and anchorage.

The maximum draft that could be carried at mean low water June 30, 1912, through the northwest passage was 17 feet and through the main ship channel was 27 feet.

The mean variation of the tide amounts to 2.6 feet.

The amount of commerce during the year 1911 amounted to 764,775 short tons, valued at $25,711,987, consisting principally of cattle, cigars, coal, fish, canned turtle soup, lumber, merchandise, naval stores, railroad iron, stone, tobacco leaf, and water. The commerce increased 74.3 per cent during the year.

The improvement of the northwest passage affords a short cut for vessels drawing less than 17 feet of water plying between Tampa and Key West. This improvement, however, has not affected freight rates. By virtue of steamship competition Key West enjoys much more favorable freight rates than points farther north in the State, but this is not in any way due to improvements made by the United States.

It is proposed to use the amount estimated as a profitable expenditure during the fiscal year 1914 in maintaining the channel through northwest passage.

July 1, 1911, balance unexpended	$24,680.36
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	23,185.10
July 1, 1912, balance unexpended	1,495.26
July 1, 1912, outstanding liabilities	550.00
July 1, 1912, balance available	945.26
Amount appropriated by river and harbor act approved July 25, 1912	63,000.00
Amount available for fiscal year ending June 30, 1913	63,945.26
Amount (estimated) required to be appropriated for completion of existing project	[1] Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 15,000.00

(See Appendix P 8.)

9. *Kissimmee River.*—This river rises in Lake Tohopekaliga, near the central part of the State. It flows in a southerly direction through Lakes Cypress, Hatcheneha, and Kissimmee and empties into Lake Okechobee. The total distance from source to mouth is 137 miles.

Before improvement the Kissimmee River was tortuous, shallow, and obstructed by snags and overhanging trees. At ordinary stages the least depth was about 2 feet, and in dry seasons navigation was altogether suspended. Canals had been made through some of the worst bends by private enterprise.

The original project for the improvement of this river, which is the existing project, was adopted June 13, 1902. It provides for a channel 30 to 60 feet wide and 3 feet deep at ordinary low water stages from the town of Kissimmee to Fort Bassenger, and for a channel 25 feet wide and 3 feet deep in Southport Creek, at an estimated cost of $24,220.90. This project is based on House Document No. 176, Fifty-seventh Congress, first session, in which report a map of the river will be found. This report is also given in Annual Report of the Chief of Engineers, 1902, pages 1226–1261. Contains maps.

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[1] Exclusive of amount available for fiscal year 1913.

An examination and survey of this river was authorized by the river and harbor acts approved March 3, 1909, and June 25, 1910, and a report thereon is now in the course of preparation.

No modification has been made in the existing project.

During the fiscal year 272 feet of training wall on Southport Canal (the portion of the river between Lake Tohopekaliga and Cypress Lake), which was so damaged by the hurricane of October 17, 1910, as to obstruct the channel, was removed and placed on shore above high water, and 10 piles were driven to repair portions of the training wall remaining intact. The total cost of this work was $100.10.

At the close of the fiscal year ended June 30, 1912, the sum of $30,339.38 had been expended on this project, of which amount $9,563.30 was applied to maintenance of the improvement. Receipts from sales, $5.

The project is completed. The maximum draft that can be carried over the shoalest part of the river is 2½ feet, at ordinary low stage of water. The usual elevation of water level due to freshets is 4 feet. As a result of this improvement navigation is possible by small boats during the entire year, and as the river is the only means of transportation for most of the points along its course, the improvement has been of considerable advantage.

The distance between Kissimmee and Fort Bassenger, the towns between which funds have been expended in improving the river, is 99½ miles. The river, together with Lake Okechobee and the Caloosahatchee River affords a navigable waterway, however, from the Gulf of Mexico to Kissimmee, a distance of 309 miles.

Commerce.—The commerce for the calendar year 1911 consisted of fruit, fish. fertilizers, feed, groceries, general merchandise, logs, lumber, naval stores, vegetables, and wood. The amount for the year was 46,273 short tons, valued at $1,634,560, being an increase in tons of 49 per cent over the preceding year. The increase is due to a general prosperity, and particularly to an increase in the fruit and vegetable output.

The river is the only means of communication (other than roads) between some 3,000 square miles of territory along the river and Kissimmee, the nearest point touched by a railroad.

The improvement has had no effect on freight rates.

No estimate is submitted as a probable expenditure for the fiscal year ending June 30, 1914, as it is not thought that any further good can be accomplished under present project. The project needs revision, and a report thereon is now in preparation in connection with examination and survey authorized by the river and harbor acts approved March 3, 1909, and June 25, 1910.

July 1, 1911, balance unexpended	$2,612.72
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	100.10
July 1, 1912, balance unexpended	2,512.62

(See Appendix P 9.)

10. Orange River, Fla.—This stream rises in the swamps in the northern part of Lee County, Fla., and empties into the Caloosahatchee River about 24 miles above its mouth. Orange River is about 12 miles long. Its general direction of flow is northwesterly.

The section included in the project is 5.6 miles long and extends from the mouth to Buckingham.

In its original condition this section was obstructed by snags and overhanging trees and afforded a depth of 1.5 feet for a distance of about 6 miles above the mouth.

The available channel in its original condition was only about 30 feet wide.

The plane of reference is mean low water. Tidal effect is perceptible at the head of navigation.

The original project, which is also the existing project, was adopted by Congress June 13, 1902, and provides for a channel 50 feet wide and 4 feet deep from the mouth to the head of navigation. The estimated cost was $2,500. This project is based upon the report contained in House Document No. 318, Fifty-sixth Congress, first session. This document does not contain a map.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Head to Caloosahatchee River, thence to Gulf.[1]	House	248	Fifty-fourth	Second	1897	1569-1572
Lake Okeechobee to Gulf of Mexico and Orange River.[1]	do	347	Sixtieth	First	1907	

[1] No maps.

No modification has been made to the existing project.

There were no operations during the year and no expenditures were made.

The amount expended on existing project to the close of the fiscal year ending June 30, 1912, was $6,100, of which amount $4,100 was applied to maintenance.

The project has been 80 per cent completed. The result of the work done has been to clear the river of obstructions, so that a navigable channel 50 feet wide and 4 feet deep exists from the mouth to the head of navigation, excepting one place in the upper portion, where the river banks are only 40 feet apart.

The maximum draft that can be carried June 30, 1912, is 4 feet over the shoalest part under improvement.

The usual variation of the water surface due to freshets is 2 feet.

The length of the improved section of the river is 5.6 miles.

The head of navigation is the iron bridge at Buckingham, 5.6 miles above the mouth.

The commerce during the calendar year 1911 amounted to 5,390 short tons. It consisted mostly of fertilizers, general merchandise, oranges, grape fruit, and vegetables, of a total value of $281,650.

The improvement has caused a material increase in the development of the adjacent territory.

As there were no established freight rates prior to the improvement, no change can be noted.

It is proposed to apply the amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, to work of maintenance to make the improvement available.

Amount that can profitably be expended in fiscal year ending June 30, 1914, for maintenance of improvement	$1,000

(See Appendix P 10.)

11. Charlotte Harbor, Fla.—Charlotte Harbor lies 70 miles south of Tampa Bay. From the entrance from the Gulf of Mexico it extends easterly about 11 miles and then northerly about 11 miles. The width of the harbor is about 5½ miles. The total area is 111 square miles. The general depth is from 5 to 15 feet, with deeper water in places along the middle line. The entrance, Boca Grande Pass, is straight and fairly stable in position and depth, with a least channel depth of 19 feet. Within the entrance there is an anchorage having an area of 580 acres and a depth of 18 feet and over. Between this anchorage and Punta Gorda there is an available channel depth of 15 feet, excepting the shoals, from 6 to 10 miles from the entrance, over which originally a least depth of 9 feet existed and in the channel leading to the wharves at Punta Gorda in the mouth of Peace Creek at the northern extremity of the harbor, which in its natural condition gradually shoaled to a depth of 8 feet at the upper end.

The plane of reference is mean low water.

The width of channel in its original condition was indeterminate, the shoal places being on broad flats.

The distance from the entrance at Boca Grande to the main entrance to Tampa Bay is 67½ miles and to the northwest entrance to Key West Harbor is 170 miles.

The original project for the improvement of Charlotte Harbor adopted in 1891 contemplated a channel 200 feet wide and 12 feet deep from the entrance to the wharves at Punta Gorda, at an estimated cost of $127,500, reduced in 1896 to $100,000. This project was practically completed in 1899, although a portion of the channel leading to the wharves at Punta Gorda was only 120 feet wide and other portions were only 160 feet wide. The widths provided appeared to be sufficient for the needs of commerce.

The amount expended on original and modified projects, prior to operations on existing project, was $100,000.

The existing project contemplates securing an available channel depth of 24 feet and a width of 300 feet from the Gulf of Mexico to Boca Grande, at an estimated cost of $40,000 and $4,000 annually for maintenance, provided local interests contribute one-half the estimated original cost thereof. This project was adopted by Congress July 25, 1912, and is based upon reports printed as House Document No. 699, Sixty-second Congress, second session (with map).

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entrance to Punta Gorda [1]					1891 [1]	1646-1651
Do.[1]	House	76	Fifty-sixth	First	1900	2048-2054
Do.[2]	do	121	Fifty-eighth	Second	1904	1714-1718
Do.[2]	do [3]	1	Sixtieth	First		

There has been no modification of the existing project.

There were no operations during the year and no expenditures made, the project not having been authorized until after the close of the year.

The maximum draft that could be carried June 30, 1912, over shoalest part under improvement was 19 feet.

The mean tidal range is 1.4 feet.

The commerce of this locality amounts to 519,000 short tons. It consists of phosphate rock, lumber, ties, crates, naval stores, fruits, and vegetables, valued at $3,005,000.

It is proposed to apply the amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, to maintenance in order to keep the improvement available.

Amount appropriated by river and harbor act approved July 25, 1912	$20,000
Amount available for fiscal year ending June 30, 1913	20,000
Amount required for expenditure in fiscal year ending June 30, 1914, for maintenance of improvement	[4] 4,000

(See Appendix P 11.)

12. Caloosahatchee River, Fla., between Puntarasa and Fort Thompson.—The Caloosahatchee River rises in Lake Okechobee and flows in a westerly direction, emptying into the Gulf of Mexico at Puntarasa, Fla. The distance from the lake to the gulf is 81 miles. Before improvement there was a navigable channel with a least depth of 5 feet at mean low water from Puntarasa to Fort Myers, and a channel with a least depth of 3.5 feet from Fort Myers to Fort Thompson. Above Fort Thompson the river was obstructed by snags and overhanging trees. Previous projects have involved work from Puntarasa to Fort Thompson, a distance of 59½ miles. The distance from Puntarasa to Fort Myers is 21½ miles.

The original project, adopted in 1882 and modified in 1886 and 1888, provided for a channel 100 feet wide and 7 feet deep at mean low water from the mouth to Fort Myers, for a channel 4 feet deep at mean low water across the shoal at Beautiful Island, and for snagging and cutting trees on the upper river.

The original project was based upon the examination report published in Annual Report of the Chief of Engineers for 1879, pages 863 to 870.

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[1] Contains maps. [2] No maps. [3] Committee on Rivers and Harbors.
[4] Exclusive of amount available for fiscal year 1913.

The modified project was based upon report published in Annual Report of the Chief of Engineers for 1888, pages 1095–1102. A map of the river is published in Annual Report of the Chief of Engineers for 1889, opposite page 1337.

The project, as modified, was completed in 1901, at a total cost of $33,600. Maintenance work has been required from time to time since. Up to the end of the fiscal year ending June 30, 1912, $16,901.05 had been expended for maintenance of the upper river.

The existing project, adopted by the river and harbor act of June 25, 1910, provides, in accordance with plans printed in Rivers and Harbors Committee Document No. 8, Sixty-first Congress, second session (no map), for a channel 200 feet wide and 12 feet deep over the bar at the entrance below Puntarasa and 100 feet wide and 10 feet deep thence to Fort Myers, with a turning basin at that point, at an estimated cost of $119,000, with $2,000 annually for maintenance.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Gulf of Mexico to Lake Okechobee [1]					1879	863–870
Head of Orange River to Caloosahatchee River, thence to Gulf of Mexico.[1]	House	248	Fifty-fourth	Second	1897	1569–1572
Orange River to Gulf of Mexico [1]	do	818	Fifty-first	First	1900	2032–2040
Lake Okechobee to mouth of river [1]	do	180	Fifty-ninth	do	1906	
Lake Okechobee to Gulf of Mexico [1]	do	347	Sixtieth	do	1907	

[1] No maps.

No modification has been made in the existing project.

During the fiscal year ending June 30, 1912, work was continued under the contract with the Bowers Southern Dredging Co., of Galveston, Tex., dated May 31, 1911, and the channel was completed to the full projected depth and width except in section G, about 5½ miles above Puntarasa, where rock was encountered at a depth of 8½ feet below mean low water. In September the dredge belonging to the contractor was leased for the purpose of removing this rock, but after three days' work the lease was canceled, the plant proving not suitable for the work. On March 1, 1912, an arrangement was made with the Hillsboro Dredging Co. for the removal of this rock. Blasting was commenced on June 1, but was discontinued by the contractor under the belief that most of the rock would be removed without blasting. Nothing further was done under this contract during the year. Thirty channel marks were established in October, 1911, to indicate the channel and thus prevent deterioration due to boats grounding on the banks.

The total expenditure during the fiscal year ending June 30, 1912, was $48,147.62.

The amount expended on work under the existing project up to the close of the fiscal year ending June 30, 1912, was $112,668.63. None of this amount was applied to maintenance of improvement.

This project was 95 per cent completed on June 30, 1912. The channel is now available for use to Fort Myers. The maximum draft that could be carried June 30, 1912, over the shoalest part of the locality under improvement below Fort Myers was 9 feet and between Fort Myers and Fort Thompson 4 feet.

The mean range of tide in the lower river is 1.6 feet. Freshets cause the upper river to rise as much as 12 feet above mean low stage.

The stream is navigable, in fact, through Lake Okechobee and the Kissimmee River to the town of Kissimmee, a distance of 309 miles above the entrance. Fort Thompson is 59½ miles above the mouth.

The commerce for the year 1911 consisted in cattle, cigars, crate material, crude petroleum, fish, hogs, lumber, merchandise, naval stores, oranges, fruit, and vegetables. The tonnage for the year amounted to 89,009 net tons, valued at $3,880,596, being an increase in tons over the preceding year of 134 per cent. The cause of this increase is threefold—dredging in the Caloosahatchee River, dredging in the Everglades, and large land sales between Fort Myers and the lake. The large increase may not hold after the dredging operations are completed in the future, but the heavy settlement of the surrounding country indicates a continued healthy growth.

There is one steamer line giving regular daily service down the river and one line giving regular daily service up the river, with a rate per ton mile of 6⅔ cents on general merchandise. With the exception of the Towles Line to Key West, the other many boats are private. There are in all about 15 boats that can be said to be regular boats, and in addition there are 56 boats in the fish trade.

No lines were abandoned during the year. Two lines enlarged their service, and the Towles Line to Key West extended its service to Fort Myers as soon as the dredged channel permitted.

The improvement has had no effect on freight rates, and as the river does not parallel the railroad it probably will not. No railroad serves the territory adjacent to the river above or below Fort Myers, and all the produce from this territory and supplies for it must, therefore, be handled on this river. The river is therefore an important factor and distributor for the railroad at Fort Myers and also forms a comparatively easy outlet for the country adjacent to Lake Okechobee. The several prosperous little towns on the Caloosahatchee River, and likewise the lower islands and towns on the southern Gulf coast, are absolutely dependent upon the river as a means of obtaining their supplies from Fort Myers and as a means of getting their produce to Fort Myers for shipment to other markets.

It is proposed to apply the amount required for expenditure in fiscal year ending June 30, 1914, to maintenance work by dredging.

July 1, 1911, balance unexpended	$54,478.99
June 30, 1912, amount expended during fiscal year, for works of improvement	48,147.62
July 1, 1912, balance unexpended	6,331.37
July 1, 1912, outstanding liabilities	50.00
July 1, 1912, balance available	6,281.37
Amount appropriated by river and harbor act approved July 25, 1912	5,000.00

Amount available for fiscal year ending June 30, 1913	$11,281.37
July 1, 1912, amount covered by uncompleted contracts	6,348.82
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]2,000.00

(See Appendix P 12.)

13. Sarasota Bay, Fla.—The west coast of Florida from a point about 10 miles south of the Anclote River to a point about 20 miles north of the Caloosahatchee River is bordered by keys separated from the mainland by sounds of very variable widths and depths, forming an intercoastal waterway along the coast. Sarasota Bay is the name given to that portion of waterway lying between Tampa Bay and Sarasota Pass. Under this heading is also included the improvement of Little Sarasota Bay, which is the name applied to that portion of the waterway lying between Sarasota Pass and Caseys Pass, opposite the town of Venice. The distance from Tampa Bay to Sarasota, opposite Sarasota Pass, is 20 miles, and the distance from Sarasota to Venice is 18 miles. Sarasota Bay varies in width from one-half mile to 3 miles and Little Sarasota Bay from one-fourth to 1 mile.

Before improvement there was a navigable channel in Sarasota Bay with a least depth of 5 feet at mean low water, except at two shoals, where the depths were 4.3 and 3.5 feet, respectively. Little Sarasota Bay had a channel with a least depth of 1.2 feet at mean low water, except at one shoal which was bare at low water.

The original, which is also the existing, project was adopted in 1889 and provided for a channel 100 feet wide and 5 feet deep at mean low water from Tampa Bay to Sarasota at an estimated cost of $17,500. This project was modified in 1896 to provide also for a channel 75 feet wide and 3 feet deep from Sarasota, through Little Sarasota Bay, to Caseys Pass, the estimated cost of the modified project being $55,000, subsequently increased to $70,000 and again in 1911 to $95,000. The project was further modified by the river and harbor act of March 2, 1907, so as to provide for continuing the improvement to Venice, about 2 miles southeast of Caseys Pass.

This project is based upon House Document No. 61, Fifty-first Congress, 1st session (contains maps), also published in the Annual Report of the Chief of Engineers for 1890, pages 1615–1620.

The project is therefore to secure a channel 100 feet wide and 5 feet deep at mean low water from Tampa Bay to Sarasota, and a channel 75 feet wide and 3 feet deep at mean low water thence to Venice.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Inside passage through Sarasota Bay to Lemon Bay.[2]	House	377	Fifty-sixth	First	1900	2055-2065
Tampa Bay to Gasparilla Sound [3]	do	849	Sixty-first	Second	1909	----------

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[1] Exclusive of amount available for fiscal year 1913. [2] Contains maps. [3] No maps.

During the fiscal year ending June 30, 1912, Clambar Cut, Oyster Bar Cuts Nos. 1 and 2, section A of North Creek Cut, and a length of 2,000 feet of section B of North Creek Cut were dredged to a least depth of 3½ feet and width of 50 feet at a cost of $5,219.18.

There had been expended on the existing project up to June 30, 1912, $87,472.16.

The project is about 75 per cent completed. The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality under improvement is 5 feet between Tampa Bay and Sarasota and 2 feet between Sarasota and Venice.

The mean range of tide is 1.5 feet.

The distance from Tampa Bay to Saratota is 20 miles, and from Sarasota to Venice is 18 miles.

The waterway is navigable its entire length of 38 miles.

The commerce for 1911 amounted to 35,811 short tons, valued at $1,589,393. It consisted principally of crate material, fertilizer, fish, fruit, merchandise, naval stores, and oysters. The commerce increased 73.7 per cent over that in 1910. Daily boat service is maintained between Sarasota and Tampa. One additional steamer was added to this line during the year. The improvement affords navigation facilities for a section heretofore undeveloped and which is now being rapidly settled and cultivated.

The improvement is the controlling factor in freight rates, and were it not available for purposes of navigation freight rates would be much higher.

It is proposed to apply the amount required for expenditure in fiscal year ending June 30, 1914, in furtherance of the project by dredging for the purpose of the extension of benefits.

July 1, 1911, balance unexpended	$16,789.77
June 30, 1912, amount expended during fiscal year, for works of improvement	5,219.18
July 1, 1912, balance unexpended	11,570.59
July 1, 1912, outstanding liabilities	3,002.59
July 1, 1912, balance available	8,568.00
Amount appropriated by river and harbor act approved July 25, 1912	13,000.00
Amount available for fiscal year ending June 30, 1913	21,568.00
July 1, 1912, amount covered by uncompleted contracts	8,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 12,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 13,000.00

(See Appendix P 13.)

14. Manatee River, Fla.—The river rises in the western part of the central portion of the peninsula of Florida and empties into the southern part of Tampa Bay. Its length is about 50 miles and its general direction of flow is westerly.

For a distance of 13 miles above the mouth the river is a tidal estuary from one-half mile to 1 mile in width. From the head of the estuary to Rye the width varies from 80 feet to 600 feet. The original channel width was indeterminate, but was in places not more than 50 feet for the available depths given.

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[1] Exclusive of amount available for fiscal year 1913.

In its original condition this river had an available channel 6 feet deep to Palmetto, 6½ miles above the mouth; 3 feet deep to Ellenton, 10 miles above the mouth; and 1½ feet deep to Rye, 24 miles above the mouth.

The plane of reference for the lower river is mean low water and for the upper river mean low stage.

The river is under improvement for a length of 22 miles, measured from its mouth.

The original project was adopted in 1882 and contemplated a channel 100 feet wide and 13 feet deep from Tampa Bay to Shaw and McNeills Points. This project was modified in 1886 so as to provide for a channel 100 feet wide and 8 feet deep to Manatee and in 1897 to provide for a cut-off into Terriceia Bay.

The amount expended on original and modified projects prior to operations on existing project was $69,350.80, of which amount the sum of $15,643.20 was applied to maintenance.

The existing project provides for a channel 100 feet wide and 13 feet deep from Tampa Bay to McNeills Point, 100 feet wide and 9 feet deep to Rocky Bluff, and 75 feet wide and 4 feet deep to Rye; also a cut-off channel, 100 feet wide and 6 feet deep, from the river into Terriceia Bay, at an estimated cost of $130,520. This project was adopted by Congress March 2, 1907, and in its present condition is based upon report published in House Document No. 117, Fifty-eighth Congress, second session. (This document does not contain a map.) No modification has been made in the existing project.

Reference to examinations or survey reports and maps or plates not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Manatee to mouth [1]	Senate	131	Forty-seventh	First	1882	1819-1821
Tampa Bay to Mitchelville					1888 [2]	1108-1112
Manatee River to Terriceia Bay					1897 [2]	1562-1563
Mouth to Rye [2]	House	271	Sixty-second	Second		

[1] No maps.

[2] Contains maps.

There were no operations during the year and no expenditures were made.

The total expended on existing project to June 30, 1912, was $80,710, of which amount the sum of $10,000 was applied to maintenance.

The approved project is about 65 per cent completed. Excepting the channel at the entrance, all the work contemplated has been completed.

The result of the work accomplished has been to make the channel less tortuous and to increase the available depth to Rock Bluff 3 feet and to Rye 1½ feet. Maintenance work is required to restore the depth of 4 feet to Rye. The maximum draft that could be carried June 30, 1912, is 9 feet to Rocky Bluff, and 3 feet to Rye.

The mean range of tide at the entrance is 1.6 feet. At low stages of the upper river the tide is perceptible as far as Rye, the head of navigation. The annual variation of water surface in the upper river on account of freshets is about 3 feet.

The lengths of the improved sections of the river are 12 miles from the mouth to Rocky Bluff and 12 miles from Rocky Bluff to Rye, 24 miles in all.

The head of navigation is the bridge at Rye 24 miles above the mouth.

The commerce during the calendar year 1911 amounted to 63,607 short tons. It consisted mostly of celery, Fuller's earth, merchandise, naval stores, oranges, sand and shell, tomatoes, and other vegetables. The total value was $3,019,790. The commerce increased 75.5 per cent over the previous year. The increase is largely due to the improvement, which has contributed to the growth of the community. There was a very material increase in the vegetable crop of the year.

The improvement of this stream is the controlling factor in the regulation of freight rates.

It is proposed to apply the amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, to maintenance work where most needed for the purpose of making the improvement available.

Amount appropriated by river and harbor act approved July 25, 1912	$5,000
Amount available for fiscal year ending June 30, 1913	5,000
Amount required for expenditure in fiscal year ending June, 30, 1914, for maintenance of improvement	[1] 5,000

(See Appendix 14.)

15. Tampa Bay, Fla.—This bay is located on the west coast of Florida. The distance from the entrance to the bay to its head at Gadsens Point is approximately 25 miles. The average width of the bay is about 7 miles. Gadsens Point is at the southern end of a peninsula, on both sides of which arms of the bay extend. The easterly arm is known as Hillsboro Bay and the westerly arm as Old Tampa Bay. At the head of Hillsboro Bay lies the city of Tampa, and on the eastern shore of Old Tampa Bay lies Port Tampa. Port Tampa is about 547 miles from New Orleans and 250 miles from Key West.

Before improvement the least depth between the Gulf of Mexico and Port Tampa was 13 feet.

The original project, adopted August 11, 1888, contemplated a channel 200 feet wide and 20 feet deep at mean low water from Tampa Bay to Old Tampa Bay. The estimated cost of this work was $63,000. Prior to this work was carried on in connection with improvement of Hillsboro Bay.

The total expenditure under this project was $130,000.

The existing project was adopted March 3, 1899. It provides for a channel 27 feet deep at mean low water from the Gulf of Mexico to Port Tampa, 500 feet wide across the bar and 300 feet wide in the bay, a channel of full width and 24 feet deep to be first secured, and subsequently deepened. The estimated cost was $750,000.

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[1] Exclusive of amount available for fiscal year 1913.

This project was an item in the river and harbor act of March 3, 1899. The estimate of cost was subsequently prepared and was approved by the Secretary of War April 10, 1899.

This project was modified March 3, 1905, by Congress authorizing the Secretary of War to expend the balance remaining to the credit of this improvement in securing a channel 26 feet deep with sufficient width, and by providing that no expenditure should be made until the owners of the terminals at Tampa Bay should by valid contract agree that the wharfage charges at such terminals should be submitted for approval to the Secretary of War. A schedule of such charges was approved by the Secretary of War on October 26, 1906.

The existing project is to secure a channel from the Gulf of Mexico to Port Tampa 26 feet deep at mean low water, 500 feet wide across the bar, and 300 feet wide in the bay.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
The bay					1872 [1]	587-647-648
Entrance Tampa Bay to wharves at Tampa.	House	82	Forty-fifth	Third	1879	870-873
Entrance Tampa Bay to city of Tampa.					1887 [1]	1257-1258
Port Tampa to mouth of bay	House	194	Fifty-third	Third	1896 [1]	1570 et seq.
Do	do	86	Fifty-fifth	First	1897 [2]	1596-1601
Port Tampa to mouth of bay in Gulf of Mexico.	do	52	do	Third	1899 [1]	1640-1643

[1] No maps. [2] Contains maps.

No work was done on the improvement during the year. Expenditures were for contingencies.

The amount expended on work of existing project up to the close of the fiscal year ending June 30, 1912, was $635,172.16, of which amount $27,711.35 was applied to work of maintenance.

The project is completed. Shoaling has occurred in sections A, D, E, and K, amounting to about a foot, and in section F 1.6 feet.

The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality under improvement is 24.4 feet. The mean range of tide is 1.5 feet at the entrance and 2 feet at Port Tampa.

The distance from the entrance to the bay to Port Tampa is 35 miles.

Tampa Bay is navigable in fact over its entire area.

The commerce for the year 1911 amounted to 2,864,997 tons, valued at $49,343,589, consisting principally of cigars, coal, crude oil, fertilizers, fish, fuller's earth, lumber, naval stores, phosphate, tobacco leaf, fruit, and merchandise. Tampa Bay must be traversed by the water-borne commerce bound to and from Tampa, Port Tampa, St. Petersburg, points on Boca Ceiga Bay, Clearwater Harbor, Manatee

River, and Sarasota Bay. Its commerce in reality is the combined commerce of all these points. Tampa is the general collecting and distributing center. (See also Hillsboro Bay.)

The improvement in connection with improved tributary waterways has lowered the freight rates for many points as much as 25 per cent. As tributary waterways are further improved, these benefits will be further extended.

It is proposed to apply the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, to work of maintenance to make the full depth of the improvement available.

July 1, 1911, balance unexpended	$19,898.59
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	7,046.29
July 1, 1912, balance unexpended	12,852.30
Amount appropriated by river and harbor act approved July 25, 1912	9,000.00
Amount available for fiscal year ending June 30, 1913	21,852.30
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 9,000.00

(See Appendix P 15.)

16. Harbor at St. Petersburg, Fla.—The city of St. Petersburg is situated on the west shore of Tampa Bay, at a point about 30 miles distant from the entrance to the bay, as measured along the present ship channel. It is 21 miles from the city of Tampa and 8¾ miles from Port Tampa.

The water front of St. Petersburg is devoid of shelter from easterly winds. Tampa Bay is about 10 miles wide opposite this locality, and troublesome wave action occurs along this shore, caused by winds from easterly directions. In 1911 local interests excavated a channel leading directly shoreward from the bay into a basin excavated within the natural shore line near to and south of the southern corporate limits of the city. The channel is said to have been made 120 feet wide and 13 feet deep and the basin 450 feet wide, 1,360 feet long, and 14 feet deep. In its present condition the channel has a depth of 9 feet for a width of 75 feet, and the basin has a considerable area where depths of less than 10 feet are found. A least depth of 4 feet is found within the limits of the basin.

Bayboro Harbor, the local name for the basin before described, can accommodate vessels of 9 feet draft over a portion of its area. The wharves in front of the city can accommodate vessels drawing from 8 feet to 11 feet of water. These wharves can not be safely used during easterly storms.

The original project, which is also the existing project, was adopted by Congress July 25, 1912, and contemplates widening and deepening the channel entering Bayboro Harbor, so as to provide a depth of 10 feet and a width of 200 feet at the outer end, widening to 300 feet at the inner end, and protecting the channel by a jetty along the south side, at an estimated cost of $32,000 and $1,500 annually for maintenance; provided, that before improvement is begun satisfactory assurances will be given the Secretary of War that local interests will do all necessary work inshore of the east side of First Street, including the widening of the basin 175 feet and rounding off the corner at the entrance and the maintenance of the basin to a depth of 10 feet; and provided further, that the frontage on the basin acquired by the city will be moved northward 300 feet and the land along Salt Creek be reserved for future enlargements, the exact lines to be determined by the Chief of Engineers, United States Army.

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[1] Exclusive of amount available for fiscal year 1913.

There has been no expenditure under this project.

This project is based upon the reports contained in House Document No. 512, Sixty-second Congress, second session (with maps).

A report on a preliminary examination of this harbor may be found printed as House Document No. 148, Fifty-ninth Congress, first session (without maps).

There has been no modification of the existing project.

There have been no operations under this project.

The maximum draft that can be carried over the portion which it is proposed to improve is 9 feet.

The mean tidal range is 1.84 feet.

The length of channel which it is proposed to improve is about 2,900 feet.

As shown by the statistics accompanying the report on the preliminary examination, submitted June 5, 1911, the yearly commerce of this locality at that time amounted to 771,850 short tons. It consisted mostly of lumber, building and paving materials, fruits, naval stores, and general merchandise, aggregating in value $24,490,000.

It is proposed to apply the amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, for maintenance of the improvement when completed.

Amount appropriated by river and harbor act approved July 25, 1912	$32,000
Amount available for fiscal year ending June 30, 1913	32,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 1,500

(See Appendix P 16.)

17. Hillsboro Bay, Fla.—The bay is an arm of Tampa Bay. It is about 9 miles long and 4½ miles wide. Tampa is located at its head and is 259 miles from Key West and 550 miles from New Orleans. Before improvement the channel from deep water in Hillsboro Bay to the city of Tampa was narrow and tortuous, with least depth of about 4 feet at mean low water.

The first project, adopted in 1880, provided for a channel 9 feet deep at mean low water, 150 feet wide in the bay, and 200 feet wide in Hillsboro River. In 1888 the proposed depth was reduced to 8 feet. This project was practically completed in 1893 at a cost of $80,000.

A second project, adopted March 3, 1899, contemplated a channel 12 feet deep at mean low water, 150 feet wide in the bay, and 200 feet wide in the river, from the 12-foot contours in the bay to a point 100 feet south of the Lafayette Street Bridge in Hillsboro River. The estimated cost was $300,000. The total expenditure under this project was $275,000. The project was completed, except that the width in a small part of the bay channel was only 110 feet.

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[1] Exclusive of amount available for fiscal year 1913.

A third project, adopted March 3, 1905, provided for a channel 20 feet deep at mean low water and 150 feet wide from the lower bay to the mouth of Hillsboro River, with a turning basin at inner end 450 feet wide and 1,050 feet long, at an estimated cost of $448,350. The work was completed on February 29, 1908. The full depth was obtained in the channel excepting in the northwesterly end of the turning basin, where there is a minimum depth of 16.8 feet at mean low water, over a small area where ledge rock is found.

The amount expended on original and modified projects prior to operations under existing project was $740,180.13.

The existing project, adopted June 25, 1910, is based on plans printed in House Document No. 634, Sixty-first Congress, second session (with maps), and provides for obtaining a channel 200 feet wide and 24 feet deep at mean low water from Tampa Bay to the turning basin at the mouth of Hillsboro River following the line of the 20-foot channel completed under previous project, a channel 300 feet wide and 24 feet deep from the turning basin eastward to the mouth of the Ybor Estuary; thence northward and up the estuary; and a channel of the same dimensions from the mouth of the estuary, southward through Sparkmans Bay and the present Tampa northern channel to the main channel. The estimated cost of this work is $1,750,000, with an annual charge for maintenance of $20,000 for five years and for $10,000 thereafter.

The initial appropriation for work under this project was made and the project, therefore, adopted, subject to the following conditions:

That no expenditure be made on that part of the harbor between the new turning basin and Ybor City until the Secretary of War is assured that the local municipality will construct wharves or slips having an available length of not less than 1,400 feet, which shall be open for the use of the general public under reasonable regulations and charges, and also that the municipality has obtained such control of the property for at least 700 feet on each side of the proposed Ybor Channel throughout its length as will insure its use primarily in the interest of general commerce on equal terms to all, and that all wharfage charges and regulations shall be reasonable and fully controlled by the municipal authorities and subject to the approval of the Secretary of War.

This project was modified February 16, 1912, so as to provide for a straight channel in Ybor Estuary, in lieu of the channel shown on the map forming part of House Document No. 634, Sixty-first Congress, second session.

The existing project is to secure a channel 200 feet wide and 24 feet deep at mean low water from Tampa Bay to the turning basin at the mouth of the Hillsboro River, following the line of the 20-foot channel completed under previous project; a channel 300 feet wide and 24 feet deep from the turning basin eastward to the mouth of the Ybor Estuary, and thence northward and up the estuary in a straight line; and a channel of the same dimensions from the mouth of the Estuary southward through Sparkman Bay and the present Tampa northern channel to the main channel.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entrance to Tampa Bay to wharves at Tampa					1879 [1]	870-873
Entrance to Tampa Bay to Tampa					1887 [1]	1257-1258
Entrance to Tampa	House	229	Fifty-fourth	Second	1897 [1]	1574-1578
Tampa Bay to Tampa	do	545	Fifty-fifth	do	1898 [2]	1257-1260
Do	do	806	Fifty-eighth	do	1904 [1]	1736-1738

[1] No maps.

[2] Contains maps.

During the fiscal year section B was widened to full width for 1,400 feet; section C was completed to full depth and width for 3,796 feet and to full depth and a width of 150 feet for 167 feet; section D was dredged to full depth and a width of 150 feet for the entire length (15,650 feet). The Hendry and Knight Channel was dredged for its full width from the turning basin eastward for 3,850 feet and for half its width for an additional 400 feet. Between the turning basin and the Seaboard Air Line Railway bridge full depth of 24 feet was obtained except where rock rose above the level of the proposed bottom, and in these localities all the soft material overlying the rock was removed. In the remainder of this portion of the work depths generally of from 16 to 19 feet were obtained, full depth over rock having been made except in limited areas. The expenditures during the fiscal year amounted to $155,158.69, none of which was for maintenance.

The amount expended on work of existing project up to the close of the fiscal year ending June 30, 1912, was $320,751.94, none of which was for maintenance.

The river and harbor act of February 27, 1911, made an appropriation of $300,000 for continuing improvement and authorized continuing contracts for prosecution of the project in the additional sum of $300,000. The sundry civil act approved August 24, 1912, appropriated $200,000, leaving a balance of $100,000 yet to be appropriated.

The existing project is about 30 per cent completed. A channel 24 feet deep is available from Tampa Bay to the turning basin at the mouth of the Hillsboro River. In section A and the southern half of section B this channel is not full width. In the remainder of section B and section C for 25,000 feet the channel is full width. It is 150 feet wide for the remainder of section C. In section D the channel is 150 feet wide. The turning basin is full depth except along the western edge, where rock was encountered. The channel eastward from the turning basin affords a minimum depth of 16 feet, which is the minimum draft that could be carried on June 30, 1912, over that portion of the improvement below the Seaboard Air Line Railway bridge. As a result of the improvement many large ships have been coming to the port and heavier cargoes are being taken. The full depth of water available is being utilized. The distance from the lower end of section A in Tampa Bay to the Seaboard bridge, the head of navigation for seagoing vessels, is 9 miles. The distance from the bridge to deep water in the Gulf of Mexico is 41 miles. Hillsboro Bay is navigable over its entire area for small boats.

The mean range of tide is 2.2 feet.

The commerce for the year 1911 amounted to 1,637,676 short tons, valued at $29,904,179, an increase of 49.7 per cent over 1910. The commerce consists principally of cigars, coal, crude oil, fertilizers, fish, lumber, naval stores, oranges, phosphates, tobacco leaf, vegetables, and general merchandise. Three lines of steamers give regular service to New Orleans, Habana, Key West, and New York. Two of these lines each added a steamer to the Tampa run during the year. Local commerce between Tampa and other points on Tampa Bay, Sarasota Bay, Manatee River, and Boca Ceiga Bay is carried on by four lines of steamers. In addition to this there are many small gasoline boats making more or less regular runs.

Freight rates have been reduced from 30 to 40 per cent.

It is proposed to apply the amount estimated as required for expenditure during the fiscal year ending June 30, 1914, in rock removal in furtherance of the existing project. The additional work proposed is necessary in order to make the improvement available.

July 1, 1911, balance unexpended	$434, 406. 75
June 30, 1912, amount expended during fiscal year, for works of improvement	155, 158. 69
July 1, 1912, balance unexpended	279, 248. 06
July 1, 1912, outstanding liabilities	13, 616. 81
July 1, 1912, balance available	265, 631. 25
Amount appropriated by sundry civil act approved Aug. 24, 1912	200, 000. 00
Amount appropriated by river and harbor act approved July 25, 1912	250, 000. 00
Amount available for fiscal year ending June 30, 1913	715, 631. 25
July 1, 1912, amount covered by uncompleted contracts	282, 531. 33
Amount of continuing contract authorization, act of Feb. 27, 1911	300, 000. 00
Amount appropriated under such authorization	200, 000. 00
Amount yet to be appropriated	100, 000. 00
Amount (estimated) required to be appropriated for completion of existing project	[1] 700, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] [2] 200, 000. 00

(See Appendix P 17.)

18. Hillsboro River, Fla.—This river rises in marshes in the central part of the State of Florida and flows in a southwesterly direction, emptying into Hillsboro Bay at Tampa at the northern end of Hillsboro Bay. The total length of the stream is about 36 miles. Only that portion of the river between its mouth at the head of Hillsboro Bay and Lafayette Street in the city of Tampa has ever been improved. The length of this section is about 2,200 feet. Before improvement limiting depths of about 7 feet at mean low water of the Gulf were encountered in this stretch of the river. Between this point and Sulphur Springs considerable depths generally exist, but occasional shoals occur with depths of between 6 and 7 feet, the limiting depth thus being reduced to about 6 feet. Above Sulphur Springs the river shoals rapidly, the depths decreasing to less than

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[1] Exclusive of amount available for fiscal year 1913.
[2] Of this amount $100,00 is for continuing-contract work authorized by the act of 1911.

3 feet just below the site of the Tampa Electric Co.'s dam, which is at the head of navigation of the stream. The width of the section under improvement and for a short distance above is about 400 feet. The average width thence to Sulphur Springs is about 125 feet and from this point to the head of navigation about 100 feet.

The original project, adopted in 1880, provided for a channel 9 feet deep at mean low water and 200 feet wide from the mouth of the river up to a point 100 feet south of the Lafayette Street Bridge, and provided also for a channel 9 feet deep and 150 feet wide in Hillsboro Bay, connecting the mouth of the river with the 12-foot contour in the bay. In 1888 the projected depth was reduced to 8 feet. There was expended under this project the sum of $80,000.

The existing project was completed March 3, 1899, and provided for a channel in the river 12 feet deep at mean low water and 200 feet wide from its mouth to the Lafayette Street Bridge, and for a channel 12 feet deep and 150 feet wide connecting the mouth of the river and the 12-foot contour in the bay. Subsequent projects have provided for channels in the bay first provided for under projects for the improvement of Hilsboro River, so that now this project is limited to the river proper.

The existing project for this work may be found in House Document No. 545, Fifty-fifth Congress, second session (with maps).

The existing project is therefore to provide a channel 12 feet deep at mean low water and 200 feet wide from the mouth of the Hillsboro River to a point 100 feet south of the Lafayette Street Bridge.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entrance Tampa Bay to wharves at Tampa.					1879 [1]	870-873
Entrance Tampa Bay to Tampa					1887 [1]	1257-1258
Tampa Bay to Tampa [1]	House	229	Fifty-fourth	Second	1897	1574-1578

[1] No maps.

During the fiscal year the dredging for maintenance which was in progress at the close of the last fiscal year was continued until July 22, on which date the channel had been restored to its full depth and width. The expenditure during the fiscal year amounted to $8,000.

There had been expended on this project up to June 30, 1912, the sum of $283,000, of which $8,000 was for maintenance. This amount expended for improvement is also reported under the report for Hillsboro Bay, where the project covers both the river proper and channels at the head of the bay.

The project has been completed. On June 12 the maximum draft that could be carried over the shoalest part of the improvement was 12 feet. The improvement is made use of by many small boats. Near the head of the improved section the Favorite Steamship Co., which carries on a business with St. Petersburg and points on the

Manatee River, has its terminals. There are three boats daily plying between these points.

The average tidal fluctuation amounts to about 2 feet. The stream is navigable up to the dam of the Tampa Electric Co., 10 miles above its mouth, which is the head of navigation.

No commercial statistics can be given for this stream, it being impossible to separate its commerce from that of Hillsboro Bay.

The improvement has not in any way affected freight rates.

July 1, 1911, balance unexpended	$25,000
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	8,000
July 1, 1912, balance unexpended	17,000

(See Appendix P 18.)

19. *Clearwater Harbor and Boca Ceiga Bay, Fla.*—These are the names applied to portions of the sound lying between the mainland of the State of Florida and the keys bordering the west coast, north to Tampa Bay. Boca Ceiga Bay extends northward, and may be considered as beginning opposite Pass-a-Grille. Clearwater Harbor lies to the north of Boca Ceiga Bay. These two sheets of water are connected by a very narrow waterway known as "The Narrows." The northern limit of Clearwater Harbor may be taken to be opposite Big Pass. North of Clearwater Harbor the sound is known as St. Josephs Sound. Boca Ceiga Bay is about 12½ miles long and has an average width of about a mile. The Narrows are about 4½ miles in length and have an average width of about 200 yards. Clearwater Harbor is about 8 miles long, and varies in width from one-half mile to 1¾ miles. Before improvement no well-defined channel existed through the intracoastal waterway formed by the bodies of water named above. Following the best water, depths were encountered in Boca Ceiga Bay of from 2 to 31 feet; in The Narrows of from one-half to 6 feet; and in Clearwater Harbor of from 2 to 21 feet.

The original, which is the existing, project was adopted June 25, 1910, and contemplates securing a channel from Clearwater Harbor to Boca Ceiga Bay and through the upper part of said bay 5 feet deep and 50 feet wide and a channel from the lower end of said bay to Tampa Bay 7 feet deep and 100 feet wide, at an estimated cost of $59,000, increased to $79,000 in 1912, with $3,000 annually for maintenance after completion. This project is based upon plans submitted in House Document No. 1190, Sixtieth Congress, second session (with maps).

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Clearwater Harbor and Tampa					1884 [1]	1220–1221
Clearwater Harbor					1885 [1]	1828–1829
Clearwater Harbor to Boca Ceiga Bay.					1887 [1]	1259–1260
Clearwater Harbor [1]	House	249	Fifty-fourth	Second	1897	1578–1580

[1] No maps.

No modifications have been made in the existing project.

During the fiscal year the necessary cuts were made to secure a channel from Tampa Bay to the lower end of Boca Ceiga Bay 7 feet deep and 100 feet wide, except in one cut where natural depths of only a fraction of a foot less than 7 feet are found; a channel through Boca Ceiga Bay and part way through The Narrows 5 feet deep and 50 feet wide; and a channel in Clearwater Harbor from the point reached June 30, 1911, through the southern part of this harbor and part way through The Narrows 5 feet deep and 50 feet wide. The total length of the cuts made amounted to 21,853 feet. The expenditures during the year amounted to $38,618.78, all of which was for new work.

The total amount expended on this project up to the close of the fiscal year ending June 30, 1912, amounted to $59,000.

The project is 85 per cent completed. Channels of the project depths and widths are available except for a distance of 6,198 feet in The Narrows, and for a distance of 1,600 feet in Tampa Bay. In The Narrows a depth of 1.5 feet is encountered, which is the maximum draft that could be carried over the shoalest portion of the improvement June 30, 1912. The length of the improved section is a little less than 24 miles. On account of the work still remaining to be done in The Narrows no benefit has as yet been derived from the improvement.

The mean range of tide is 1.8 feet.

The distance between named limits of authorized channels is 28 miles.

The waterway is navigable in fact throughout its length.

The commerce for the year 1911 amounted to 5,175 short tons, valued at $354.318, a decrease of 27.1 per cent below that of the preceding year. The commerce consists principally of fish, gasoline, ice, general merchandise, sponges, and wood. As all water-borne commerce must still go outside in small boats, the conditions are not favorable at the present time, but a reasonable increase can be expected upon completion of this improvement. The completion of the improvement will afford a much shorter water route from Tampa and points in the waterway than the present rail hauls, and much better freight rates will probably follow. In its present state the improvement has had no effect on freight rates.

It is proposed to use the amount estimated as required for expenditure during the fiscal year ending June 30, 1913, in maintaining the improvement.

July 1, 1911, balance unexpended	[1] $38,618.78
June 30, 1912, amount expended during fiscal year, for works of improvement	38,618.78
Amount appropriated by river and harbor act approved July 25, 1912	20,000.00
Amount available for fiscal year ending June 30, 1913	20,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2] 3,000.00

(See Appendix P 19.)

20. *Crystal River, Fla.*—This river rises near the town of Crystal River, Fla., and is formed by several springs. It flows in a west-

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[1] Incorrectly stated in the report for 1911 as $38,978.78.

[2] Exclusive of amount available for fiscal year 1913.

erly direction and empties into the Gulf of Mexico. The length of the river is 9 miles. Before improvement the channel from the Gulf of Mexico to the town of Crystal River was tortuous and shallow, the least depth being 2.7 feet at mean low water of the gulf. The entrance to the river was obstructed by reefs and sand bars.

The project, adopted June 13, 1902, which is the existing project, contemplates a channel 60 feet wide and 6 feet deep at mean low water of the gulf from the Gulf of Mexico to the town of Crystal River. The estimated cost was $84,647.46.

The project is based upon the report contained in House Document No. 386, Fifty-sixth Congress, first session (with maps).

No modification has been made in the existing project.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Head to mouth [1]	Senate	131	Forty-seventh	First	1882	1316-1317
Crystal River and bar at mouth [1]	House	157	Fifty-third	Third	1889	1576-1578
Crystal River [1]	do	221	Fifty-fourth	Second	1897	1580-1583
Crystal River to Gulf [1]	do	395	Sixtieth	First		

[1] No maps.

Dredging for maintenance, which began June 26, 1911, was completed on July 1, 1911. This work on the first day of the year was the only work done during the year and resulted in restoring to full depth and width a cut 100 feet in length.

The expenditures during the year amounted to $2,000.

The amount expended on work of existing project up to the close of the fiscal year ending June 30, 1912, was $30,431.72, of which $5,225 was applied to maintenance of improvemeut.

The project is completed.

The maximum draft that could be carried June 30, 1912, over the shoalest part of the locality under improvement was 6 feet at mean low water.

The mean range of tide is 2.3 feet.

The river is navigable in fact from the entrance to the town of Crystal River, a distance of 9 miles.

The commerce for 1911 amounted to 5,192 short tons, valued at $253,700, and consisted principally of cedar logs, fish, ice, merchandise, and oysters. The increase in tonnage over the preceding year amounted to 148.9 per cent. This increase was due to the resumption of operations of a pencil mill, the cedar logs for this mill forming nearly four-fifths of the total commerce on the river. The improvement has had no effect on freight rates, which are very high.

It is proposed to use the amount estimated as required for expenditure during the fiscal year ending June 30, 1914, in maintaining the improvement.

July 1, 1911, balance unexpended	$2,000.00
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,000.00
Amount appropriated by river and harbor act approved July 25, 1912	2,000.00
Amount available for fiscal year ending June 30, 1913	2,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 2,000.00

(See Appendix P. 20.)

21. Anclote River, Fla.—This river rises in marshes in the western part of Florida, flows in a generally southwesterly direction, and empties into the Gulf of Mexico about 35 miles north of the entrance to Tampa Bay. Its total length is about 20 miles. It is a narrow and crooked stream from its source to a point about 2½ miles from the mouth, where its volume is increased by the flow from Tarpon Springs, which enters the river through Tarpon Bayou. From this point to its mouth the stream has the characteristics of a small tidal estuary. The project for improvement includes only the 2½-mile stretch from Tarpon Springs to the mouth, through which, before improvement, there was a narrow tortuous channel, with depths varying from 2 to 20 feet.

The original, which is also the existing, project was adopted March 3, 1899, and contemplates securing a channel 100 feet wide and 6 feet deep at mean low water from Anclote Anchorage to Sponge Harbor, and thence 4 feet deep at mean low water to the county bridge at Tarpon Springs, at an estimated cost of $51,500.

This project is based upon the report contained in House Document No. 200, Fifty-fifth Congress, first session (with maps).

No modifications have been made in the existing project.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Tarpon Springs to mouth [2]	House	71	Forty-eighth	Second	1885	1280-1281
Anclote River [2]	do	160	Fifty-third	Third	1895	1573-1576

No work was done during the fiscal year.

The expenditures during the fiscal year, amounting to $1,571.74, were for contingencies.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $56,500, of which $4,848.50 was applied to maintenance of improvement. Of the amount expended $225 was derived from sales.

The project is completed.

The maximum draft that could be carried June 30, 1912, over the shoalest part of the locality under improvement was 6 feet to Sponge Harbor and 4 feet to the county bridge at Tarpon Springs.

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[1] Exclusive of amount available for fiscal year 1913.

[2] No maps.

The mean range of tide is 2 feet.

The length of the channel improved is 5 miles. The river is navigable, in fact, for a distance of 17 miles above the entrance.

The commerce for the year 1911 amounted to 14,274 tons, valued at $1,000,598, and consisted principally of fish, gasoline, logs, lumber, merchandise, and sponges. The tonnage decreased 21.2 per cent below that of the preceding year. One of the two boats making regular trips between Tampa and Tarpon Springs was taken off during the year.

Freight rates have been lowered about 20 per cent as a result of the improvement.

July 1, 1911, balance unexpended	$1,796.74
June 30, 1912, amount expended during fiscal year, for works of improvement	1,571.74
July 1, 1912, balance unexpended	225.00

(See Appendix P 21.)

22. *Suwannee River, Fla.*—The Suwannee River rises in southern Georgia, near the Okefinokee Swamp; flows in a general southerly direction and empties in the Gulf of Mexico about 115 miles north of the entrance to Tampa Bay. The total length of the river is 245 miles. The project for improvement includes only that portion of the river between the mouth and Ellaville, which is 125 miles up the river. Before improvement the channel was narrow and tortuous and obstructed by a bar at the entrance and by bowlders, soft-rock shoals, snags, and overhanging trees. The least depth at mean low-water stage was 15 inches.

The original, which is likewise the existing, project was adopted in 1879, and contemplates securing a channel 150 feet wide and 5 feet deep from the mouth to Rollands Bluff (75 miles) and thence 60 feet wide and 4 feet deep to Ellaville (60 miles), by dredging, building wing dams, and snagging, at an estimated cost of $65,158.

The project is based upon the report contained in House Document No. 82, Forty-fifth Congress, third session (no maps).

Report on this river may also be found in House Document No. 427, Sixty-first Congress, second session (no maps), from White Springs to the Gulf of Mexico.

No modification has been made in the existing project.

No work was done during the year. The expenditures during the year amounted to $269, which were for contingencies.

The amount expended under the existing project up to the close of the fiscal year ending June 30, 1912, was $75,736.90, of which amount $9,472.96 was applied to work of maintenance of improvement.

The project was 95 per cent completed on June 30, 1912. As a result there is now a channel 5 feet deep at mean low water of the Gulf and 50 feet wide from the Gulf of Mexico to a distance of one-half mile above the mouth of the river, and thence to Rollands Bluff a channel 5 feet deep at mean low-water stage and 100 feet wide. From Rollands Bluff to Beesons Shoal, 2½ miles below Ellaville, there is a channel 4 feet deep at mean low-water stage and varying from 30 to 100 feet in width.

The maximum draft that can be carried over the shoalest part of the locality under improvement is 5 feet.

The mean rise and fall of tide at Suwannee River entrance is 2.4 feet. The annual variation of the water surface in upper river on account of freshets is about 5 feet.

The village of Ellaville is at the head of navigation. Length of the navigable channel is 135 miles.

The commerce for the year amounted to 40,968 short tons, valued at $845,194, and consisted of naval stores, crossties, and groceries. The tonnage for the year was 145 per cent greater than that for the preceding year.

The improvement has had no effect upon freight rates.

There is no regular boat service on the river.

No funds are estimated for use in the fiscal year 1914, a reexamination having been directed by the river and harbor act approved July 25, 1912.

July 1, 1911, balance unexpended	$269
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	269

(See Appendix P 22.)

23. *Withlacoochee River, Fla.*—The Withlacoochee River rises in the swamp lands of Polk County, Fla., not far from the town of Kissimmee. It flows north and then west and empties into the Gulf of Mexico about 20 miles southeast of Cedar Keys, Fla., and 101.7 miles north of the entrance to Tampa Bay. Its total length is about 120 miles. Projects for improvement have covered the river from its mouth to Pembertons Ferry, 77 miles up the river. Before improvement the entrance to the Withlacoochee River was crooked and obstructed by reefs. The least depth at mean low water of the Gulf was about 3 feet. Vessels loaded and discharged at an anchorage (called the loading pool) about 9 miles from the entrance. Inside the mouth there was, at mean low water of the Gulf, a depth of 7 to 8 feet as far as Inglis, a distance of 9 miles. Above Inglis the river was obstructed by numerous shoals and snags.

The original project, adopted in 1879, provided for a channel having an available depth of 2 feet during about half the year from the mouth of the river to Pembertons Ferry, a distance of 77 miles, and was completed in 1892.

The second project, adopted June 13, 1902, provided for straightening the channel from the loading pool to the river mouth and deepening it to 8 feet and for work of maintenance.

There was expended on the original and modified projects prior to operations under the existing project the sum of $59,700.41. Of this amount $5,296.38 was applied to the construction of the dredge *Florida*.

A good deal of dredging has been done by the Port Inglis Terminal Co. under permission granted by the Secretary of War.

The existing project, adopted by the river and harbor act of March 2, 1907, provides for a channel 100 feet wide and 10 feet deep at mean low water from Port Inglis to the anchorage in the Gulf of Mexico, at an estimated cost of $215,400 and $5,000 annually for maintenance.

This project is based upon the report contained in House Document No. 483, Fifty-ninth Congress, second session (with maps).

No modification has been made of the existing project.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Hays Ferry to mouth					1880 [1]	1110-1119
Mouth to head of navigation [1]	House	158	Fifty-third	Third	1895	1579-1586
Mouth to head of navigation [2]	do	199	Fifty-fifth	Second	1898	1363-1369

[1] No maps.

[2] Contains maps.

During the year dredging was carried on with leased plant from July 5 to August 7, 1911, partially removing the shell and broken stone from sections L, N, O, P, P′, and Q. All of this was new work.

There was expended for this work during the year the sum of $12,296.97.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $221,089.28. No maintenance work has yet been done under this project.

The project is about 80 per cent completed.

A channel 85 feet wide and 10 feet deep at mean low water of the Gulf has been completed to within about three-fifths of a mile of the wharf at Port Inglis, and nearly completed for the remaining distance, depths of 8 feet having been obtained. Rock encountered at this depth prevented the completion of the channel to full depth over the remaining distance. Navigation has been made much easier by the elimination of some sharp turns and by the increased depth and width in the completed portions.

The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality under improvement was 8 feet.

The mean rise and fall of tide at Withlacoochee River entrance is 2.8 feet. The annual variation of water surface in the upper river on account of freshets is about 6 feet.

Length of the navigable channel from the loading pool in the Gulf of Mexico to Port Inglis, at the mouth of the river, is 9 miles; thence up the river to Inglis, 9 miles; thence to Pembertons Ferry, 68 miles.

The head of steamboat navigation is at the county bridge, about 2 miles below Istachatta, or 76 miles above the mouth. The river is navigable, in fact, to Dobes Hole, about 112 miles above the mouth.

The commerce for the year 1911 amounted to 140,285 short tons, valued at $1,416,806, an increase of 12.6 per cent over that of the preceding year. The commerce consisted principally of coal, iron, pyrites, general merchandise, and phosphate. The improvement has materially reduced freight rates throughout the rock phospate mining region.

It is proposed to use the amount estimated as required for expenditure for the fiscal year ending June 30, 1914, in maintaining the improvement.

July 1, 1911, balance unexpended	$12,607.28
June 30, 1912, amount expended during fiscal year for works of improvement	12,296.97
July 1, 1912, balance unexpended	310.31
Amount appropriated by river and harbor act approved July 25, 1912	38,000.00
Amount available for fiscal year ending June 30, 1913	38,310.31
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

(See Appendix P 23.)

24. *Removing the water hyacinth from Florida waters.*—Before improvement many Florida rivers, especially the St. Johns and its tributaries, were badly obstructed by packs of hyacinths. The first project, adopted March 3, 1899, provided for the construction of a boat and booms and for destroying the hyacinth by crushing. The estimated cost was $36,000, plus an undetermined amount for annual expenditure. Nothing was done under this project, as experience in Louisiana showed that destruction by crushing was impracticable.

In 1902 the existing project was adopted, providing for the destruction of the hyacinths by any means whatsoever. The plan adopted under this project was to spray the plants with an arsenical compound. The estimated cost of this work was $50,000 per annum.

Under this project the sum of $84,977.97 was expended. A steamer was purchased and fitted up for spraying, and the main stream of the St. Johns River and its tributaries were cleared of hyacinths.

The act of 1905 modified the project by prohibiting any process injurious to cattle. The plan of closing inlets, sloughs, etc., with booms, breaking up the packs with a suitable boat, and propelling them into the current in order that they might be carried where they would not cause an obstruction was in use until November, 1909, when a hyacinth elevator, consisting of a catamaran scow equipped with an inclined conveyer driven by a gasoline engine, was put in service. This method has proven quite satisfactory, and during the remainder of the fiscal year the St. Johns River was satisfactorily cleared of the plant so far as it was an obstruction to navigation.

The existing project is therefore to remove the hyacinth by means of an elevator which either places the plants on shore or forms them in deep piles which are carried away by the currents.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Investigation [2]					1899	1613-1622
Do.[2]	House	91	Fifty-fifth	Third		
Experiments [2]					1906	1235-1240

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[1] Exclusive of amount available for fiscal year 1913.

[2] No maps.

No work was done during the year, no difficulty being experienced with hyacinths. Expenditures during the year were for maintenance and repair of plant and contingencies and amounted to $85.

The amount expended on work of existing project up to the close of the fiscal year ending June 30, 1912, was $126,474.23.

As a result of work previously done, the St. Johns River and Black Creek remained open for free navigation during the year. In the spring the hyacinths were found to be growing freely, and it will be necessary to resume operations early in the year to keep the river open.

It is proposed to use the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, in continuing this work.

July 1, 1911, balance unexpended	$15,027.57
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	85.00
July 1, 1912, balance unexpended	14,942.57
July 1, 1912, outstanding liabilities	500.00
July 1, 1912, balance available	14,442.57
Amount (estimated) required to be appropriated for completion of existing project	[1] Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 10,000.00

(See Appendix P 24.)

25. *Removing sunken vessels or craft obstructing or endangering navigation.*—(*a*) On July 28, 1911, allotment of $35,000 was made from the permanent indefinite appropriation provided by section 20 of the river and harbor act of March 3, 1899, for removing sunken vessels or craft obstructing or endangering navigation, for the removal of the wreck of the steamer *Zeeburg* from the entrance to St. Johns River, Florida. Proposals were opened October 20, 1911; Johnston & Virden, of Lewes, Del., were the lowest bidders at the price of $46,400, which was $11,400 in excess of the allotment for the work. An additional allotment of $14,000 was made on November 6, 1911, making a total of $49,000. Contract for the work was entered into with Johnston & Virden on October 20, 1911. Work began February 6, 1912, and was still in progress at the close of the fiscal year, when about 20 per cent of the work had been accomplished. This vessel was wrecked while attempting to make the entrance to the river during a storm on October 24, 1909. The vessel took bottom and drifted onto the south jetty at a point about 1,300 feet from the outer end of the jetty. The stern rested on the jetty, and the bow, pointing about northward, rested on the sand bottom in 6 to 8 feet of water at low water. The vessel is a steel hull screw steamer, built at Sutherland, England, in 1899. It was 325 feet long, 48.6 feet broad, 21.3 feet depth of hold, and had a registered tonnage of 3,059 gross and 1,958 net. Most of the valuable portions of the cargo, consisting of general merchandise and fertilizer material, had been previously removed.

The wreck is being broken up with dynamite and removed piecemeal.

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[1] Exclusive of the balance unexpended July 1, 1912.

(*b*) On August 31, 1911, an allotment of $800 was made from the permanent indefinite appropriation provided by section 20 of the river and harbor act of March 3, 1899, for removing sunken vessels or craft obstructing or endangering navigation, for the removal of the wrecks of the towboat *Geo. W. Childs* and of the schooner *Heartsease* from the harbor at Key West, Fla.

The *Geo. W. Childs* was a steam screw towboat built of wood in Camden, N. J., in 1874. It was 100.8 feet long, 20.4 feet broad, and 9.6 feet deep. Its registered tonnage was 107 tons gross and 53 tons net. The wreck had lain partially submerged for about two years about 50 feet outside the channel end of Currys Wharf. It had been stripped of its machinery, excepting the boiler.

The schooner *Heartsease* was built of wood in Roslyn, N. Y., in 1882. It was 52.3 feet long, 14.8 feet broad, and 3.9 feet deep, and was of 16 tons gross and net register. This vessel was sunk in the hurricane of October 12, 1909, and laid, abandoned by the owner, in the midst of the anchorage area for light-draft vessels, locally known as Hurricane Harbor. The depth of water over this wreck was 3 feet.

These wrecks were removed by hired labor. Work began October 17 and was completed November 13, 1911. They were broken in pieces by dynamite, and the pieces were raised by a floating derrick, the services of a diver being used occasionally.

The area formerly covered by the wreck of the *Geo. W. Childs* now has a depth of 12 feet over the bottom. The site of the wreck of the *Heartsease* now has a depth of 9 feet at mean low water.

The total cost of the removal of these wrecks was $701.62.

(*c*) On September 8, 1911, an allotment of $3,000 was made from the permanent indefinite appropriation provided by section 20 of the river and harbor act of March 3, 1899, for removing sunken vessels or craft obstructing or endangering navigation, for the removal of the wreck of the barge *Zoradia* in the Gulf of Mexico at a point about 7½ miles southwesterly from the lighted beacon at the entrance to the Withlacoochee River, Fla.

After due advertisement, bids were opened November 20, 1911. John L. Inglis, of Jacksonville, Fla., was the lowest bidder at the price of $1,500. Contract was entered into November 28, 1911. Work began January 20, 1912, and was completed March 2, 1912. The contract required completion February 22, 1912. The contractor having failed to make application for an extension of the time limit for completion before the expiration of the contract, the time was waived by implication and the contractor bore the additional expense to the United States entailed, which amounted to $40. This amount was deducted from the contract price.

The barge was 100 feet long, 30 feet broad, and 8 feet deep, strongly constructed of yellow pine and was equipped with a revolving crane. While in service, loading phosphate from barges into vessels in the loading pool off the mouth of the Withlacoochee River, it caught fire and was turned adrift. It partially burned and sank at the point before mentioned.

After attempting other methods, the wreck was raised by two lighters, used as pontoons, partially filled with water, fastened by chains to the wreck and then pumped out. This floated the wreck which was towed into the channel of the Withlacoochee River at Port Inglis and grounded near the south shore. It was then broken up, and such portion of the timber as was of sufficient value was salvaged by the contractor. The remainder was piled on shore and burned.

This work cost $1,808.

(*d*) On December 4, 1911, an allotment of $1,500 was made from the permanent indefinite appropriation provided by section 20 of the river and harbor act of March 3, 1899, for the removal of the wreck of the dredge *Hester* in the channel at the north end of the uncompleted Section I of the improvement in progress between Clearwater Harbor and Tampa Bay, Fla.

After due advertisement, bids were opened January 19, 1912. The Edwards Construction Co. was the lowest bidder at the price of $1,180. Contract was entered into January 29, 1912. Work began February 16, 1912, and was completed March 8, 1912.

The wreck was formerly the United States dredge *Suwanee.* It was of wood, 100 feet long, 24 feet broad, and 5 feet deep. The upper works were destroyed by fire and the hull sank on July 23, 1911. All parts of the machinery, including the boilers, were removed and placed on lighters. The hull was broken up by dynamite and placed on the spoil bank, near at hand, and there burned.

This work cost $1,323.83.

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

Reports on preliminary examinations and surveys required by the river and harbor act of March 3, 1909, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. *Preliminary examination and survey of Manatee River, Fla., with a view to securing a depth of 13 feet from the mouth to Palmetto and Bradentown, and thence such depth to Ellenton and Rye as commerce may demand.*—Reports dated April 15, 1909, and January 7, 1910, with map, are printed in House Document No. 271, Sixty-second Congress, second session. The improvement of Santee River further than as already provided for in the existing project is not deemed advisable at the present time.

2. *St. Augustine Harbor, Fla., with a view to constructing the necessary sea walls and also to providing a channel 16 feet deep and 300 feet wide from the city of St. Augustine to the ocean.*—Reports dated April 1, 1909, and June 8, 1911, with map, are printed in House Document No. 580, Sixty-second Congress, second session. The improvement of this harbor by the United States in the manner apparently desired by the interests concerned is not deemed advisable at the present time in the interest of navigation; but a plan for shore protection of Anastasia Island by groins, at a cost of $15,000, is presented as being probably desirable.

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and surveys required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. *Preliminary examination of Jupiter Inlet, Fla.*—Report dated September 20, 1910, is printed in House Document No. 257, Sixty-second Congress, second session. The improvement of Jupiter Inlet, Fla., is not considered worthy of being undertaken by the United States at the present time.

2. *Preliminary examination of St. Johns River, Fla., from Jacksonville to Palatka, with a view to securing increased depth.*—Report dated May 29, 1911, is printed in House Document No. 281, Sixty-second Congress, second session. The improvement of this locality is not considered worthy of being undertaken by the United States at the present time.

3. *Preliminary examination of Withlacoochee River, Fla., from Port Inglis to Panasoffkee.*—Report dated February 16, 1911, is printed in House Document No. 395, Sixty-second Congress, second session. The improvement of this locality by the General Government in the manner apparently desired by the interests concerned is not deemed advisable at the present time.

4. *Preliminary examination of Gilberts Bar (St. Lucie Inlet), Fla.*—Report dated September 22, 1910, is printed in House Document No. 471, Sixty-second Congress, second session. The improvement of this locality by the United States as recommended in House Document No. 1312, Sixtieth Congress, second session, is considered advisable.

5. *Preliminary examination and survey of Biscayne Bay, Fla., with a view to providing a channel 20 feet deep and 300 feet wide through the entrance, and a channel of the same depth 150 feet wide through the bay to the mouth of Miami River.*—Reports dated September 22, 1910, and October 7, 1911, with map, are printed in House Document No. 554, Sixty-second Congress, second session. A plan for improvement at an estimated cost of $400,000, subject to certain specified cooperation by local interests, is presented.

6. *Preliminary examination and survey, respectively, of Charlotte Harbor, Fla., with a view to securing a channel of increased depth from the Gulf of Mexico to Punta Gorda.*—Reports dated February 18, 1911; November 29, 1911, and April 1, 1912, with map, are printed in House Document No. 699, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $40,000 for first construction, with $4,000 annually for maintenance, provided local interests bear one-half the cost ($20,000), is presented.

7. *Preliminary examination, with plan and estimate of cost of improvement, of Key West, Fla., and channels leading thereto.*—Reports dated November 30, 1910, and March 18, 1912, with map, are printed in House Document No. 706, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $48,000 is presented.

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Reports on preliminary examinations and surveys required by the river and harbor act approved February 27, 1911, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. *Preliminary examination of Pithlachascotee River, Fla.*—Report dated August 11, 1911, is printed in House Document No. 429, Sixty-second Congress, second session. The improvement by the General Government of this stream in the manner apparently desired is not deemed advisable at the present time.

2. *Preliminary examination of St. Johns River, Fla., from deep water at or below Commodores Point to deep water above Sixmile Creek westward of the middle ground between Arlington Cut and the western shore of the river, etc.*—Report dated July 15, 1911, is printed in House Document No. 493, Sixty-second Congress, second session. The improvement of this stream by the General Government in the manner apparently desired by interested parties is not deemed advisable at the present time.

3. *Preliminary examination and survey of St. Petersburg Harbor, Fla.*—Reports dated June 5 and November 21, 1911, are printed in House Document No. 512, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $32,000 for first construction, subject to certain cooperation by local interests, is presented.

4. *Preliminary examination of St. Lucie Inlet, Fla., with a view to obtaining a depth of from 12 to 14 feet.*—Report dated August 29, 1911, is printed in House Document No. 675, Sixty-second Congress, second session. The improvement by the United States of this locality in the manner directed is not deemed advisable at the present time; but an immediate expenditure of about $300,000 for excavating a cut of 18 feet center depth across the obstructing rock and the ocean bar is now advisable as a preliminary step to securing later the full project channel of 18 feet depth over at least 200 feet width from the ocean to Sewalls Point.

5. *Preliminary examination, with plan and estimate of cost of improvement, of channel between the St. Johns River, Fla., and Cumberland Sound, by way of the Sisters out of the St. Johns River, with a view to straightening and deepening the channel.*—Reports dated July 12 and November 11, 1911, are printed in House Document No. 898, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $101,000 for first construction, with $1,000 annually for maintenance, is presented.

The local officer was also charged with the duty of making other preliminary examinations and surveys provided for by the river and harbor acts approved June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. *Oklawaha River to Dora Lake, Fla.*
2. *Channel from St. John River through Lake Dexter, thence to Lake Woodruff, thence to St. Johns River below Hawkinsville.*
3. *Lake Crescent and Dunns Creek, Fla., from the St. Johns River to Crescent City.*

4. Lemon Bay to Gasparilla Sound, Fla.

5. Clearwater Harbor, Fla., from the mouth of the Anclote River to the beginning of the channel now being constructed by the Government from the south end of Clearwater Harbor into and through Boca Ceiga Bay, thence into Tampa Bay.

6. Wekiva River, Fla.

7. Kissimmee and Caloosahatchee Rivers, and Lake Okechobee and tributaries, Fla., with a view to adopting a plan of improvement of said waters which will harmonize as nearly as may be practicable with the general scheme of the State of Florida for the drainage of the Everglades.

IMPROVEMENT OF RIVERS AND HARBORS IN THE MONTGOMERY, ALA., DISTRICT.

This district was in the charge of Lieut. Col. G. D. Fitch, Corps of Engineers. Division engineer, Lieut. Col. Lansing H. Beach, Corps of Engineers.

1. *Carrabelle Bar and Harbor, Fla.*—The town of Carrabelle is situated at the mouth of Carrabelle River, which empties into St. George Sound. The river forms the inner harbor and along the water front its channel varies from 9 to 14 feet in depth, with a minimum width of about 100 feet.

Dog Island anchorage, a protected portion of St. George Sound, showing a 4-fathom depth over a considerable area, forms the outer harbor. Between the 10-foot contours in the inner and outer harbors there is a bar about 6,000 feet wide, which originally had a minimum low-water depth over it of 3½ feet to 4 feet.

Dog Island anchorage is connected with the Gulf of Mexico by East Pass, which originally had limiting low-water depths of about 17 feet on the outer bar and 16.5 feet on the inner bar.

The size of the harbor is approximately 28 square miles, situated 180 miles by water east of Pensacola Harbor.

The original project for Carrabelle Bar and Harbor, Fla., adopted June 3, 1896, provided for dredging a channel 10 feet deep and 100 feet wide from Dog Island anchorage, St. George Sound, to the city of Carrabelle, at a cost estimated in 1900 at $47,300, in addition to appropriations already expended on the project amounting to $22,399.54.

By act of Congress approved June 13, 1902, this project was extended to include the improvement of East Pass by dredging a channel across the bar 20½ feet deep and 150 feet wide and closing an opening in Dog Island at an estimated cost of $27,450. This part of the project is completed.

The amount expended on original and modified projects prior to operations under existing project was $21,704.08.

The existing project was adopted by act approved March 2, 1907, which is a further extension of the original project, and provides for securing a channel 18 feet deep and 100 feet wide from the 18-foot contour in the outer harbor to a point opposite the beacon situated about 1,000 feet up the river from its mouth, with a suitable turning basin, thence 10 feet deep and 100 feet wide to the wharves at Carrabelle, but the size of the basin was not fixed by Congress, and the estimated cost of the extension of the project has not been determined.

References to examination or survey reports and maps or plans not in project document.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Dog Island Harbor and Crooked River [1]	Senate	131	Forty-seventh	First	1882	1314
Whole [1]	House	328	Fifty-third	Third	1895	1680
East Pass entrance [1]	do	63	Fifty-sixth	First	1900	2152
Whole [2]	do	227	do	Second	1901	1800
Whole [1]	do	422	Fifty-ninth	First		
Gulf-Carrabelle [1]	do	622	Sixty-second	Second		

[1] No maps.

[2] Contains maps.

During the fiscal year ending June 30, 1912, dredging operations under contract were carried on, beginning at the 18-foot contour and working inward. This resulted in a channel 100 feet wide and 18 feet deep, with a length of 3,100 feet. During the fiscal year there was expended the sum of $2,853.02, of which $1,200 has been applied to maintenance.

The amount expended under existing project to the close of the fiscal year ending June 30, 1912, was $135,163.99, of which about $60,000 has been applied to maintenance. Amount returned to the Treasury June 2, 1909, to the credit of emergency appropriation, act of March 2, 1907, $138.65.

The channel at the mouth of the river has been partially dredged from time to time. During 1906 it was completed to a width of 100 feet and a depth of 10 feet from the wharves at Carrabelle to a point 1,400 feet south of the red beacon, and also widened 100 feet at the turn opposite Timber Island, but it shoaled at the inner end. During the fiscal year 1909 a channel 100 feet wide and 10 feet deep was completed from the wharves at Carrabelle to site of proposed turning basin.

The shoaling of this channel is believed to be due largely to storm action, and it should be protected to the eastward. This will be largely accomplished by the work which the Georgia, Florida & Alabama Railway Co. is to undertake.

In 1904 the channel across the outer bar was deepened by dredging from about 17 feet to 20 feet, and across the inner bar from about 16.5 feet to 17.5 feet, this limiting depth being confined to a short distance.

The approved project up to the close of the fiscal year ending June 30, 1912, was 78 per cent completed. The maximum depth in river channel was 11 feet; between river and anchorage, 14 feet; through East Pass, 20.5 feet; the ruling depth throughout the channel, 11 feet; increased depth secured under work thus far accomplished, 5 feet; the ordinary range of the tide is about 2 feet.

The commerce of the port of Carrabelle consists principally of timber, naval stores, dressed and kiln-dried lumber, shingles, fish, oysters, and general miscellaneous, and for the calendar year 1911 is estimated at a valuation of $772,588, or 40 per cent of the total reported by the customhouse for both Carrabelle and Apalachicola.

With the work done a substantial reduction in ocean rates is expected, due to increased draft and improved facilities for lighterage, and a further reduction on freight handled by rail should result from the completion of the project for turning basin and 18-foot channel thereto, and the improvements projected by the Georgia, Florida & Alabama Railway Co. in connection therewith.

It is proposed to apply the available balance to completing the project and to maintenance.

July 1, 1911, balance unexpended		[1] $40,050.38
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$1,653.02	
For maintenance of improvement	1,200.00	
		2,853.02
July 1, 1912, balance unexpended		37,197.36
July 1, 1912, outstanding liabilities		12,765.20
July 1, 1912, balance available		24,432.16
July 1, 1912, amount covered by uncompleted contracts		12,156.14

(See Appendix Q 1.)

2. *Apalachicola Bay, Fla.*—The town of Apalachicola lies at the mouth of the Apalachicola River, and the deep water along the river front forms the inner harbor.

At the mouth of the river, between the inner harbor and the 3-fathom anchorage area in Apalachicola Bay, there is a bar of which the original width between 8-foot contours was 7,000 feet and the minimum depth of water 3.5 feet. Across this bar the lumber exported is lightered either to the 3-fathom anchorage in Apalachicola Bay or through Bulkhead Shoals to the anchorage of Carrabelle, 25 miles distant. The 3-fathom anchorage area is entered via West Pass, where originally the depth was about 13 feet. The original depth over Bulkhead Shoals was less than 4 feet.

The size of the harbor is approximately 108 square miles, situated 160 miles, by water, east of Pensacola Harbor.

The original project, adopted June 14, 1880, provided for dredging a channel 100 feet wide and 11 feet deep through the bar at the mouth of the river, the width of cut to be increased to 200 feet if the results justified this enlargement.

This project was amended September 19, 1890, to include dredging a channel 9 feet deep and not less than 100 feet wide across the Bulkhead Shoals.

Upon this project as amended has been expended $154,000, of which $100,000 has been applied to maintenance in repeated dredging of the cut across the bar at the mouth of the river. The channel through Bulkhead Shoals, dredged in 1891–92, remains practically unchanged, with a minimum depth of 8 feet at mean low water.

Prior to the adoption of any project of record in this office, $18,700 was expended on this improvement—1833–1839—but the object and results of such expenditures are unknown.

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[1] Erroneously reported as $40,050.14 in report for 1911.

By act approved March 3, 1899, a new project was adopted, which provided for a channel 100 feet wide, 18 feet deep at mean low water, through the West Pass along the northern shore of St. George Island and across the bay to the water front of Apalachicola, estimated to cost $350,000, and $20,000 or $30,000 annually for maintenance of completed work.

The amount expended on this project was $130,679.26.

The existing project was adopted by act of Congress approved March 2, 1907, by which the previous project was amended so as to provide for a channel across the bar at the mouth of the Apalachicola River not less than 100 feet wide and 10 feet deep at mean low water, and a channel not less than 150 feet wide and 18 feet deep through Link Channel and West Pass to the Gulf of Mexico, at an estimated cost of $85,000, and $17,500 annually for maintenance after completion.

The existing project is covered by House Document No. 422, Fifty-ninth Congress, first session. No maps.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
All except West Pass route [1]	House	241	Forty-second	Second	1872	612
Inner harbor [1]	do	82	Forty-fifth	Third	1879	823
West Pass route [2]	do	129	Fifty-fourth	Second	1897	1655

[1] No maps. [2] Contains maps.

Operations during the fiscal year ending June 30, 1912, consisted in dredging under contract and in repairs to bulkhead. There was expended the sum of $26,482.76, of which $20,500 was applied to maintenance. The amount expended on this project up to the close of the fiscal year ending June 30, 1912, was $131,337.89. Since beginning work on this harbor there has been expended approximately $120,000 for maintenance. This does not include $650.29 for surveys at East Pass.

A channel 10 feet deep and 100 feet wide across the bar at the mouth of the river has been completed, and for the protection of this channel from westward-moving silt a bulkhead to the east of it has been built. The length of this bulkhead is 6,900 feet.

The proportion of the approved project accomplished up to June 30, 1912, is as follows: Through Link Channel and West Pass, 20 per cent; mouth of Apalachicola River, 80 per cent; the maximum draft that could be carried from Apalachicola to Link Channel was 9 feet; through Link Channel, 17 feet; Link Channel to the Gulf, 12 feet; increased depth secured at mouth of the river, 2 feet.

The ordinary range of the tide is about 2 feet.

The commerce of this port is in timber, cotton, naval stores, staves, a large quantity of dressed and kiln-dried lumber, shingles, laths, and miscellaneous freight, the total value for the calendar year 1911 being reported by the customhouse as $1,931,470 for both Apalachicola and Carrabelle. Of this amount it is estimated that 60 per cent, or $1,158,882, should be credited to the port of Apalachicola.

The portion of the project now completed gives greatly increased facilities to the commerce of this port and a substantial reduction in freight rates on coastwise commerce. The exact amount of this reduction and the reduction on foreign commerce can not yet be stated.

It is proposed to apply the balance available and funds recommended in maintenance.

July 1, 1911, balance unexpended		$27,465.61
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$5,982.26	
For maintenance of improvement	20,500.00	
		26,482.76
July 1, 1912, balance unexpended		982.85
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 20,000.00

(See Appendix Q 2.)

3. *Apalachicola River, Fla., including the Cut-off, Lee Slough, lower Chipola River, and the upper Chipola River from Marianna to its mouth.*—(*a*) *Appalachicola River, the Cut-off, Lee Slough, and lower Chipola River.*—From the junction of the Chattahoochee and Flint Rivers to the Gulf of Mexico (Apalachicola Bay) the Apalachicola River has a length of about 137 miles and a low-water slope of about 3 inches to the mile. The general direction of flow is southwesterly. The width varies from 150 to 300 yards and the available depth was originally 6 feet at low water, except where obstructed by snags and sunken logs.

The Confederate authorities obstructed the channel at a point about 47 miles above the mouth, causing the river to break through by a channel known as Moccasin Slough into the River Styx, the latter a tributary entering the Apalachicola a few miles below the Confederate obstructions. Moccasin Slough was very narrow and tortuous and much obstructed by logs, snags, etc., and the former channel has gradually filled up.

About 55 miles above the mouth steamboats may leave the river, and, after passing through the Cut-off, lower Chipola River, and Lee Slough, reenter it about 17 miles farther down, thus making many landings of much greater importance than those upon the corresponding part of the main river, which includes Moccasin Slough, above mentioned.

The original project adopted by the act of June 23, 1874, contemplated securing a channel 100 feet wide and 6 feet deep at low water by the removal of snags and overhanging trees and widening and straightening Moccasin Slough and the Elbows, at an estimated cost of $80,333.

The act of July 13, 1892, adopted an addition to the project providing for the clearing of a channel 60 feet wide and 5 feet deep through the Cut-off, Lee Slough, and the lower Chipola River, at a cost of $7,500.

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[1] Exclusive of the balance unexpended July 1, 1912.

The existing project adopted by Congress June 23, 1874, and July 13, 1892, provides for securing a channel 100 feet wide and 6 feet deep at low water in the Apalachicola River, widening and straightening Moccasin Slough and the Elbows; also for a channel 60 feet wide and 5 feet deep through the Cut-off, Lee Slough, and lower Chipola River. The estimate of cost for the combined projects was $87,833.

The existing project for Apalachicola River, Moccasin Slough, and the Elbows is based on report printed in Annual Report of the Chief of Engineers for 1873, page 698. No maps.

The existing project for the Cut-off, Lee Slough, and lower Chipola River is based on report printed in Annual Report of the Chief of Engineers for 1889, page 1416. Contains maps.

Operations during the fiscal year ending June 30, 1912, were carried on in the Apalachicola River, Cut-off, Lee Slough, and lower Chipola River in snagging and dredging, the amount expended being $5,245.19, all for maintenance.

The amount expended on work under this project since 1874 to the close of the fiscal year ending June 30, 1912, was $122,633.47. About $45,000 was expended in maintenance. In addition there was expended between 1828 and 1831, $13,000, for which no project is of record.

The project is about 96 per cent completed.

The expenditures made have improved Moccasin Slough sufficiently for present purposes and maintained the river reasonably free from snags and other obstructions and enabled steamboats to make use of the Cut-off, lower Chipola River, and Lee Slough either by day or night. An available depth of 6 feet has been secured in the Apalachicola River, except at Blountstown Bar, where the depth is but 3 feet, and 5 feet in the Cut-off, lower Chipola River, and Lee Slough. The Cut-off and Lee Slough have been widened also at the narrowest places so that steamboats can pass through readily going downstream and can pass upstream with little difficulty, but the channel in Lee Slough is still very crooked, with some sharp bends that require easing, and the steamboats prefer the main river on the up trip.

The work was done with the plant belonging to the Chattahoochee and Flint River improvements, and comprised cutting overhanging timber, removing snags and logs, blasting out cypress stumps, and widening the slough and Cut-off by clearing the points of timber and dredging them off, depositing the dredged material in the deep holes or upon the banks.

Variation of the water level is from 0 to 30 feet at Chattahoochee River bridge.

This river is navigable throughout its entire length of 137 miles.

The commerce of the river consists chiefly of cotton, naval stores, general merchandise, saw logs, and timber for export, and is so combined with that of the Chattahoochee, Flint, and upper Chipola Rivers that a separation is impossible. The commerce of all these streams has increased from about $4,000,000 in 1899 to $15,784,029 in 1911. For detailed statistics see report on Flint River improvement.

As the country bordering on the Apalachicola River is largely dependent upon the river for the transportation of its supplies and products, this improvement is essential to the development of this section.

It is proposed to apply the available balance and the funds recommended to maintenance of Apalachicola River proper by removing annual accumulation of snags, and to continue straightening and widening the Cut-off, Lee Slough, and Lower Chipola River to make the improvement available.

(*b*) *Upper Chipola River, Fla., from Marianna to its mouth.*—The river from Marianna to the head of the Dead Lakes has a general low-water depth of 5 feet and width varying from 60 to 200 feet, but is greatly obstructed by rock shoals, snags, and overhanging trees. Three bridges also form obstructions, their headways above low water being 17, 16, and 15 feet, respectively.

At Look and Tremble Shoal, about 45 miles above the Dead Lakes, there is a fall of 5 feet in 40 over rock bottom. At Sister Islands, between this shoal and the Dead Lakes, the main channel of the river is very tortuous and obstructed by mud bars over which there is less than 2 feet at low water. The channel through the Dead Lakes, which is considered part of this improvement, has plenty of water, but was obstructed by snags and large cypress stumps and trees.

The river rises in Jackson County, Fla., flows in a general southeasterly direction, and has a length of about 125 miles. The length under improvement is estimated at 105 miles.

The original and existing project, adopted by act of March 3, 1899, provides for clearing a low-water channel 3 feet deep and 60 feet wide from Marianna to the foot of the Dead Lakes, estimated to cost $41,000, exclusive of necessary plant, which would comprise a snagboat, drilling barge, and dump scow.

No change has been made in the project since its adoption by Congress.

The existing project for the upper Chipola River is based on report printed in Annual Report of the Chief of Engineers for 1889, page 1416. Contains maps.

The work done during the fiscal year ending June 30, 1912, consisted in dredging and in the removal of snags and stumps. All work was confined to the section below Look and Tremble Shoal. The amount expended during the year was $1,574.40. All work done was for maintenance.

The amount expended on this project up to the close of the fiscal year ending June 30, 1912, was $23,252.17, of which about $10,000 has been applied to maintenance. About 55 per cent of the project is completed.

In 1904 $5,000 was applied to the river above Sister Islands. Snags, logs, and overhanging trees were removed, and a channel blasted through the rock reefs from Marianna to Look and Tremble Shoal; wing dams were built below some of the shoals, and below Look and Tremble Shoal, down as far as Sister Islands, snags, logs, and overhanging timber were removed, as well as available funds permitted. From the lower end of the Dead Lakes for a distance of 35 miles a channel 60 feet wide was cleared of obstructions by removing logs, overhanging trees, cypress stumps, and knees. During the year snagging was confined to the lower end of the Dead Lakes. Very little benefit has been derived from the expenditure above Look and Tremble Shoal, except to timber industry, but the work done below the shoal and in the Dead Lakes has been of great benefit, as there are many turpentine stills below this shoal, giving a considerable commerce on this portion of the river, and in the Dead Lakes a large commerce in towing logs.

Three feet is the maximum depth at low water over the shoalest part of the river below Look and Tremble Shoal. The actual head of navigation at ordinary low water is Braxtons Landing, 40 miles above the foot of the Dead Lakes. The river is in fair condition to Look and Tremble Shoal.

The variation of the water level is 0 to 14 feet.

The commerce of this stream consists principally of naval stores, round and square timber, lumber,.and other miscellaneous freights, the value of which is included in the combined commerce reported under Flint River improvement.

The territory through which the stream flows is heavily timbered with long-leaf yellow pine and cypress, which is now being rafted down this stream in large quantities.

The section of country below Look and Tremble Shoal has no railroads, and depends largely upon this river, the reduction in freight rates being the lessened haul to river as compared to Apalachicola River or railroads to the north and west.

It is proposed to apply the available balance and the funds recommended to dredging and regulation of channel and to removal of snags and overhanging trees from Look and Tremble Shoal to the foot of Dead Lakes. This work is necessary to make the improvement available.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Chipola River [1]	Senate	Ex. 11	Forty-seventh	First	1882	1304
Do.[1]	House	101	Fifty-fifth	Second	1898	1423
Do.[1]	do	463	Sixty-second	do		

[1] No maps.

APALACHICOLA RIVER.

July 1, 1911, balance unexpended	$1,998.30
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,019.70
July 1, 1912, balance unexpended	978.60
July 1, 1912, outstanding liabilities	549.97
July 1, 1912, balance available	428.62
Amount appropriated by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	3,428.63

CUT-OFF, LEE SLOUGH, AND LOWER CHIPOLA RIVER.

July 1, 1911, balance unexpended	$4,363.42
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	4,225.49
July 1, 1912, balance unexpended	137.93
Amount appropriated by river and harbor act approved July 25, 1912	4,000.00
Amount available for fiscal year ending June 30, 1913	4,137.93
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

UPPER CHIPOLA RIVER.

July 1, 1911, balance unexpended	$1,822.23
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,574.40
July 1, 1912, balance unexpended	247.83
Amount appropriated by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	5,247.83
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

CONSOLIDATED.

July 1, 1911, balance unexpended	8,183.95
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	6,819.59
July 1, 1912, balance unexpended	1,364.36
July 1, 1912, outstanding liabilities	549.97
July 1, 1912, balance available	814.39
Amount appropriated by river and harbor act approved July 25, 1912	12,000.00
Amount available for fiscal year ending June 30, 1913	12,814.39
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2] 7,000.00

(See Appendix Q 3.)

4. Entrance to St. Josephs Bay, Fla.—St. Josephs Bay had never been under improvement by the Government up to adoption of project by act of July 25, 1912. The depth on the bar was about 20 feet, with varying widths. Length of the bar on channel line was about 7,330 feet. Size of the harbor, approximately 50 square miles, with depths varying from about 30 to 36 feet. The harbor is situated about 115 miles east of Pensacola Harbor.

The existing project, adopted by the river and harbor act of July 25, 1912, provides for a channel 24 feet deep and 300 feet wide over the bar, at an estimated cost of $40,000, of which sum $20,000 is to be borne by private interests.

The project is based on House Document No. 660, Sixty-second Congress, second session. Contains maps.

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[1] See consolidated money statement on this page.

[2] Exclusive of amount available for fiscal year 1913.

For reference to previous examination and survey, see House Document No. 464, Sixtieth Congress, first session, without map.

At the end of the fiscal year 1912 work had not been commenced.

The ordinary range of the tide is about 1.4 feet.

The commerce of the port consists principally of timber and its products, estimated at about $900,000 per annum.

Completion of the project will facilitate shipping interests of the port to a large extent.

It is proposed to apply the funds available and those to be supplied by private interests toward the completion of the project, additional funds recommended to be applied to maintenance.

Amount appropriated by river and harbor act approved July 25, 1912	$20,000
Amount available for fiscal year 1913	20,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 10,000

(See Appendix Q 4.)

5. *Flint River, Ga.*—Originally this river was navigable at low water from its mouth to Bainbridge, a distance of 36 miles, for boats drawing 3 feet; but the channel was narrow, crooked, and greatly obstructed by logs, snags, and overhanging trees. Above Bainbridge the channel was so obstructed by rock shoals, loose rock, and bowlders that there was no navigation except on a rise of 5 feet, when steamboats could run to Albany, 105 miles above the mouth. Above Albany to Montezuma, 182 miles from the mouth, the channel was so obstructed by sand and rock shoals, bowlders, snags, logs, and overhanging trees that the river was not navigable at a low-water stage.

This river has its source in the northern part of Georgia, flows in a general southwest direction, and its mouth is at the southwest corner of Georgia, where it unites with the Chattahoochee and forms the Apalachicola River. Its length is estimated at 360 miles. The project covers the section from the mouth to Montezuma, a distance of 182 miles.

The original project adopted June 23, 1874, called for a channel 100 feet wide and 3 feet deep at extreme low water from the mouth of the river to Albany, Ga., at an estimated cost of $184,862.

This project was extended June 14, 1880, to give a channel for light-draft steamers at moderate stages of water from Albany to Montezuma by the removal of logs, snags, and overhanging trees, cutting through rock reefs, and deepening sand bars by contraction works, at an additional cost of $15,000.

The existing project, adopted by Congress June 23, 1874, and extended June 14, 1880, provides for a channel 100 feet wide and 3 feet deep at extreme low water from the mouth of the river to Albany, Ga., at an estimated cost of $184,862, and a channel for light-draft steamers at moderate stages of the water from Albany to Montezuma by the removal of logs, snags, and overhanging trees, cutting through rock reefs, and deepening sand bars by contraction works, at an additional cost of $15,000.

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[1] Exclusive of amount available for fiscal year 1913.

There has been no modification in the existing project since adoption by Congress.

The existing project for that section from the mouth to Albany is based on report printed in Annual Report of the Chief of Engineers for 1873, page 707, and for the section between Albany and Montezuma is based on House Document No. 95, Forty-fifth Congress, third session; Annual Report of the Chief of Engineers for 1879, page 818. No maps.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Montezuma to Old Agency					1887 [1]	1290
Rock reefs at Albany and above					1889 [1]	1420

[1] No maps.

Operations during the fiscal year ending June 30, 1912, consisted in drilling, blasting, and removal of rock; in snagging and in the removal of overhanging trees, at a total cost of $14,262.13, of which $4,560 was for maintenance.

The amount expended up to the close of the fiscal year ending June 30, 1912, was $333,451.24, practically all being for permanent work.

As a result of the work done, the river is now navigable throughout the year from Albany to the mouth, there being a good channel with 3 feet available at low water. The project is about 88 per cent completed.

The section between Albany and Montezuma, 77 miles, is still much obstructed, although it has been repeatedly cleared of snags and similar obstructions in accordance with the project. The ruling depth is 2.5 feet at low water.

The water level varies from 0 to 40 feet.

During ordinary low water Albany, Ga., is the head of navigation, but in periods of extreme low water, such as occurred during the fall of 1904, interruptions occur in the section between Bainbridge and Newton.

The commerce consists principally of cotton, naval stores, provisions, general merchandise, saw logs, and timber for export. Several very large sawmills are located at Bainbridge, but no record of the amount of lumber manufactured is kept, as shipments are made by rail. A large part of the saw logs used by these mills comes down the river. The commerce of the lower part of this stream is so combined with that of the Chattahoochee and Apalachicola Rivers that it is impossible to give a statement in regard to it. The commerce of that part above Bainbridge was reported for 1911 as 10,448 short tons, valued at $785,159.

The effect of the improvement on freight rates, if any, can not be determined.

It is proposed to apply the available balance and the funds recommended toward making the improvement below Albany fully available by widening the channel in many places between Bainbridge and Newton, and removing many obstructions throughout the river below Albany.

This work is largely permanent rock work, and its completion will greatly benefit the section of country between Albany and the mouth of the river. There are many turpentine stills in operation on the river which depend upon the water transportation for their products and supplies.

July 1, 1911, balance unexpended		$19,310.89
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$9,702.13	
For maintenance of improvement	4,560.00	
		14,262.13
July 1, 1912, balance unexpended		5,048.76
July 1, 1912, outstanding liabilities		1,773.52
July 1, 1912, balance available		3,275.24
Amount appropriated by river and harbor act approved July 25, 1912		10,000.00
Amount available for fiscal year ending June 30, 1913		13,275.24
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 15,000.00

(See Appendix Q 5.)

6. *Chattahoochee River, Ga. and Ala., below Columbus.*—Columbus, Ga., is 223 miles above the junction of this river with the Flint River and 360 miles above the mouth of the Apalachicola River, which is formed by the confluence of the Chattahoochee and Flint. Originally boats drawing 22 inches were able to reach Columbus for about nine months each year, but navigation was difficult and dangerous by day and impossible by night, owing to the large accumulation of logs, snags, and overhanging trees, and to sand, rock, and marl shoals obstructing the channel.

The source of this river is in the northern part of the State of Georgia, and its mouth at junction with the Flint River is at the southwest corner of Georgia. Its length is approximately 400 miles. Its general direction of flow is southerly. The length of the section included in the project is that from the mouth to Columbus, Ga.

The original and existing project for the improvement, adopted June 23, 1874, provided for a low-water channel 100 feet wide and 4 feet deep from Columbus, Ga., to Chattahoochee, Fla., at the junction of the Flint, which was to be obtained by the removal of logs, snags, and overhanging trees, cutting through the rock and marl shoals, and scouring out sand bars by works of contraction and shore protection. The estimated cost of this work from Chattahoochee, Fla., to Eufaula, Ala., 139 miles, was $145,247, but no estimate of cost for that part between Eufaula and Columbus was ever made.

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[1] Exclusive of amount available for fiscal year 1913.

No modification of the existing project has ever been made.

The existing project is based on House Document No. 241, Forty-second Congress, second session; Annual Report of the Chief of Engineers for 1873, page 699. No maps.

The work carried on during the fiscal year ending June 30, 1912, consisted in snagging and dredging and in building and repairing jetties, at a total cost of $69,243.63. The amount expended for improvement was $17,243.63, and for maintenance, $52,000.

The amount expended on this work to the close of the fiscal year ending June 30, 1912, was $987,753.79, of which approximately $300,000 has been for maintenance.

The project is about 95 per cent completed in the upper section above Eufaula and about 10 per cent in the lower section.

Columbus is the actual head of navigation. Four feet draft can now be carried at ordinary low water from Columbus to the mouth, but at very extreme low water, such as in 1904, scant 3 feet is the maximum draft that can be counted upon.

The increased depth obtained since adoption of the project is about 2 feet.

During the last few years more liberal appropriations have permitted a more vigorous prosecution of work, and considerable progress has been made on the permanent improvement of the river. In addition to maintaining the river free from snags and obstructions, the channel for a distance of 32 miles below Columbus has been regulated by a system of jetties, and the most serious bars in the upper river have been kept open by dredging where necessary. As a result of this work Columbus has become the head of navigation, and boats are able to reach there at all times except during unusually low water, such as occurred in the fall of 1904, putting a stop to all navigation.

The variation of the water level is 0 to 47 feet at Columbus.

The commerce of this stream consists of cotton, cotton seed, fertilizers, grain, naval stores, provisions, hardware, and general merchandise, and is so combined with that of the Flint and Apalachicola Rivers that a separation is impossible. It is given under the report of the Flint River as 117,115 short tons in 1911, valued at $15,784,029.

The effect of the improvement has been to give to Columbus and all other points on the river water rates, or a material reduction over rates to all-rail points, but the exact amount of reduction can not be stated.

It is proposed to apply the funds available and the appropriation recommended for works of contraction, snagging, and dredging, snagging to be done between Columbus and the mouth of Flint River, works of regulation to extend as far down as Fort Gaines.

July 1, 1911, balance unexpended		$69, 420. 62
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$17, 243. 63	
For maintenance of improvement	52, 000. 00	
		69, 245. 63

July 1, 1912, balance unexpended	$176.99
Amount appropriated by river and harbor act approved July 25, 1912	50,000.00
Amount available for fiscal year ending June 30, 1913	50,176.99
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 80,000.00

(See Appendix Q 6.)

7. Channel from Apalachicola River to St. Andrews Bay, Fla.—The proposed route of this canal extends a distance of approximately 32 miles, 4½ miles passing through Lake Wimico, with a ruling depth of 2½ feet; the other section, for about 27½ miles, passes through various creeks and short stretches of swamp and dry land, with no available depth in the creeks except at East Bay, which is an arm of St. Andrews Bay, where the ruling depth was 3½ feet. This forms an outlet for the Chattahoochee-Flint-Apalachicola-Chipola system of rivers, with a total navigable length of 470 miles.

The original and existing project, adopted June 25, 1910, provides for a channel from Apalachicola River to St. Andrews Bay, Fla., by dredging a channel 65 feet wide and 5 feet deep by way of Lake Wimico, Searcy Creek, and the south prong of Wetappo Creek, at an estimated cost of $450,000, in accordance with report printed in House Document No. 670, Sixty-first Congress, second session. No maps.

No modification has been made in the existing project since its adoption by Congress.

Work was carried on during a part of the fiscal year under contract on the western end of the improvement, and by Government plant and hired labor on the eastern end when plant was available. Very poor progress was made by the contractor.

The contract was terminated on January 22, 1912, and the U. S. dredge *Blackwater* placed on the improvement March 4, 1912. The total length of channel completed, including portions of creeks where no dredging was required, was 9 miles. The amount expended during the fiscal year was $110,482.13, all for improvement.

The amount expended on this work to the close of the fiscal year ending June 30, 1912, was $131,833.01, all for improvement.

Up to June 30, 1912, the project was about 40 per cent completed. The project depth and width throughout the portion completed was obtained.

The improvement is not available for commerce until completed.

Until the improvement is available for commerce the effect on freight rates can not be determined.

It is proposed to apply the available funds and those recommended in dredging operations in prosecution of the project.

July 1, 1911, balance unexpended	$228,649.12
June 30, 1912, amount expended during fiscal year, for works of improvement	110,482.13
July 1, 1912, balance unexpended	118,166.99
July 1, 1912, outstanding liabilities	16,866.00

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[1] Exclusive of amount available for fiscal year 1913.

July 1, 1912, balance available	$101,300.99
Amount appropriated by river and harbor act approved July 25, 1912	70,000.00
Amount available for fiscal year ending June 30, 1913	171,300.99
Amount (estimated) required to be appropriated for completion of existing project	[1] 130,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 130,000.00

(See Appendix Q 7.)

8. *St. Andrews Bay, Fla.*—The original depth across the bars at the entrance to this harbor was about 11 feet.

The size of the harbor is approximately 104 square miles, situated 110 miles by water east of Pensacola Harbor.

The original and existing project adopted June 25, 1910, in accordance with plan printed in House Document No. 12, Sixty-first Congress, first session, is for dredging a channel 22 feet deep and 200 feet wide through East Pass, at an estimated cost of $203,560 for original improvement, and $20,000 per annum for maintenance thereafter. Contains maps.

No modification has been made in the existing project since its adoption by Congress.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Whole [1]					1889	1414
Entrance to St. Andrews Bay [2]	House	250	Fifty-eighth	Second	1904	1797

Operations during the fiscal year ending June 30, 1912, consisted in dredging on the outer bar and through Camel Back Shoal with the U. S. dredge *Caucus* at a cost for the year of $62,435.62, all for improvement.

The amount expended on this project to the close of the fiscal year ending June 30, 1912, was $108,721.53, all for improvement.

The act of June 25, 1910, appropriated $75,000 and authorized continuing contracts in the sum of $128,560 additional for the completion of the project.

All funds have been appropriated.

The proportion of the approved project accomplished up to June 30, 1912, was 59 per cent. The channels at the entrance and at Camel Back Shoal are now 21.5 feet deep and 100 feet wide, being an increase since adoption of the project of 9.5 feet on the outer bar and of 15 feet on Camel Back Shoal.

The ordinary range of tide is 1.4 feet.

The commerce of this port is principally lumber and miscellaneous merchandise, and for the calendar year 1911 is reported by the collector of the port as valued at $45,556. This, however, is not the total commerce carried by this improvement, which it is impossible to obtain owing to the character of vessels plying these waters.

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[1] Exclusive of amount available for fiscal year 1913.

[2] No maps.

The completion of the project will provide for the inception of ocean transportation and serve to test the commercial value of a harbor at this place and determine the stability of the improvement.

It is proposed to apply the funds on hand to the completion of the work in accordance with the project. No further funds are recommended.

July 1, 1911, balance unexpended	$157,274.09
June 30, 1912, amount expended during fiscal year, for works of improvement	62,435.62
July 1, 1912, balance unexpended	94,838.47
July 1, 1912, outstanding liabilities	23,634.81
July 1, 1912, balance available	71,203.66

(See Appendix Q 8.)

9. *Choctawhatchee River, Fla. and Ala.*—The Choctawhatchee has its source in southeastern Alabama, flows southerly and southwesterly to Choctawhatchee Bay, an arm of the Gulf of Mexico. The length of the river under improvement covers a distance of about 162 miles from the mouth up to Newton.

Originally the river was impassable during low water for about 10 miles below Newton, due to marl reefs and fish-trap dams, and for the remaining 152 miles to the mouth it was much obstructed by snags, logs, overhanging trees, and sand and gravel bars.

As far back as 1833 work on this river was carried on, there being expended up to 1874 a total of $12,876.62. The original project is apparently that covered by the appropriation made in the act approved June 23, 1874, which provided for removing obstructions.

The project for the improvement, as amended September 19, 1890, contemplated the creation of a low-water navigable channel throughout by removing logs, snags, and overhanging trees, by excavating rock and marl shoals, and by contraction works and shore protection, at an estimated cost of $112,832.

The project was again amended by act approved June 13, 1902, to provide for improvement of Cypress Top Outlet.

The existing project is for improvement and maintenance to provide a low-water navigable channel throughout and for improvement of Cypress Top Outlet, based upon the modifications of the acts of September 19, 1890, and June 13, 1902.

The existing project is based on the river and harbor acts above noted.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to Geneva [1]	Senate	Ex. 63	Forty-second	Second	1872	588, 640
Geneva to Newton [1]					1880	1061
Geneva and Newton [1]					1889	1428
Mouth to Newton [1]	House	876	Sixtieth	First		

[1] No maps.

Operations during the fiscal year ending June 30, 1912, consisted in deepening shoals at Stricklands Lake Bar and at Cedar Creek Shoal, about 34 miles above the mouth, and in snagging operations for a distance of about 67 miles up the river from the mouth.

The amount expended during the fiscal year was $3,063.04, of which $1,800 was for maintenance.

The amount expended on this river under the existing project (i. e., since 1874) up to the close of the fiscal year ending June 30, 1912, was $201,836.32, of which the greater part has been expended in maintenance. The expenditures prior to 1874 amounted to $12,876.62.

The project has been completed, and the additional work required is for maintenance.

A channel 40 feet wide and 3 feet deep was blasted through the marl shoals below Newton to the lower end of these shoals above Pates Landing. A channel 75 feet wide and 6 feet deep at mean low water was dredged through the bar at the mouth of the river (Cypress Top). The river has been partically cleared of snags and other obstructions from time to time, but has again become very much obstructed, being impassable during low water for boats of even light draft from Newton to the mouth of Holmes River, a distance of 122 miles, the available depth at low water being but 20 inches at the end of the fiscal year 1912. From the mouth of the Holmes River to the mouth of the Choctawhatchee River, a distance of about 40 miles, there is a good navigable channel 4 feet deep at mean low water. The actual head of navigation for regular traffic on June 30, 1912, was the mouth of Holmes River.

Variation in water surface from 0 at mean low water to 28 feet at upper limit of the project.

There is no commerce on the river above the mouth of Holmes River, with the possible exception of a small movement of logs. Below this point there is a large commerce in logs and hewn timber, and several steamers ply between Pensacola and Vernon on the Holmes River.

The commerce on this stream is mainly saw logs, timber, naval stores, and general merchandise, reported to have a valuation of $2,000,000 per annum.

The effect of the improvement on freight rates, if any, can not be stated.

The available balance and the additional appropriation recommended will be applied to removal of obstructions for maintenance of improvement below the mouth of Holmes River.

July 1, 1911, balance unexpended		$4,526.72
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$1,263.04	
For maintenance of improvement	1,800.00	
		3,063.04
July 1, 1912, balance unexpended		1,463.68
July 1, 1912, outstanding liabilities		468.48
July 1, 1912, balance available		995.20
Amount appropriated by river and harbor act approved July 25, 1912		8,000.00

Amount available for fiscal year ending June 30, 1913	$8,995.20
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 9,000.00

(See Appendix Q 9.)

10. Holmes River, Fla., from Vernon to its mouth.—Holmes River empties into the Choctawhatchee River about 40 miles above the mouth of the latter. It is a wide and deep stream to the town of Vernon, 25 miles above its mouth, but was originally obstructed by sunken logs, fallen timber, and overhanging trees, and only available for navigation by small sailing craft and barges, which occasionally made trips up to Vernon.

The source of this stream is in the southern part of Alabama, the general direction of flow is southerly, the river emptying into the Choctawhatchee River. Its length is about 160 miles, of which about 25 miles is under improvement.

The original and existing project, adopted August 11, 1888, for the improvement of the stream provides for making a navigable channel by removing logs and snags from the river and overhanging trees from its banks from the mouth up to the town of Vernon.

No modification has been made since adoption by Congress.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to Vernon [2]	Senate	Ex. 11	Forty-seventh	First	1882	1308
Do.[2]					1889	1375

Operations during the fiscal year ending June 30, 1912, consisted in maintaining the improvement by removal of obstructions and deepening the channel over Boyington Bar, 4 miles above the mouth, at a total cost of $2,032.25, of which $1,400 was for maintenance.

The total amount expended on this improvement up to the close of the fiscal year ending June 30, 1912, was $20,812.30, of which $18,651.50 was upon Holmes River and $2,160.80 upon Lagrange Bayou.

The project has been completed and additional work required is for maintenance. No increased depth secured; variation of water surface, 0, or low water, to 6 feet above.

The importance of this improvement has greatly increased in the last few years, and several steamers are now engaged in the large and growing trade between Vernon and Pensacola.

The commerce of the stream consists of cotton, turpentine, rosin, molasses, honey, and miscellaneous articles, the annual value of which in 1911 is estimated at $850,000.

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[1] Exclusive of amount available for fiscal year 1913.

[2] No maps.

As this river is the only means of transportation in that section, there is no basis for comparison, and the effect of the improvement on freight rates can not be stated.

It is proposed to apply the balance available and funds recommended in maintenance.

July 1, 1911, balance unexpended		$2,219.95
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$632.25	
For maintenance of improvement	1,400.00	
		2,032.25
July 1, 1912, balance unexpended		187.70
Amount appropriated by river and harbor act approved July 25, 1912		2,000.00
Amount available for fiscal year ending June 30, 1913		2,187.70
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 2,500.00

(See Appendix Q 10.)

11. The narrows in Santa Rosa Sound, Fla.—Santa Rosa Sound connects Choctawhatchee Bay with Pensacola Bay, its general depth being over 6 feet except through the narrows, where at several places the limiting depth was about 4.5 feet.

The west end of this improvement is 6 miles from Pensacola, Fla., and the east end 45 miles from Freeport, Fla. Length of sound, 34 miles, with an area of approximately 46 square miles. It is the tidal basin of Pensacola and Choctawhatchee Bays; rise of tide, 1.5 feet. The length of the section included in the project is 12,450 feet.

The original and existing project, adopted June 25, 1910, provides for dredging a channel 6 feet deep through the narrows, at an estimated cost of $24,000, in accordance with plan printed in House Document No. 568, Sixty-first Congress, second session. (No maps.)

No modification has been made in the existing project since its adoption by Congress.

References to examination or survey reports and maps or plans not in project document.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Bar at junction with Choctawhatchee Bay [2]					1898	1741

Operations during the fiscal year ending June 30, 1912, consisted in dredging to obtain the project depth. The project was completed by the U. S. hydraulic dredge *Blackwater* during the year. The amount expended during the year was $21,543.39, all for improvement.

The amount expended to June 30, 1912, was $22,525.86, all for improvement.

The ordinary range of the tide is about 1.5 feet.

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[1] Exclusive of amount available for fiscal year 1913.

[2] No maps.

The project is completed and has given increased facilities for the commerce between points on the Choctawhatchee and Holmes Rivers and Pensacola. Vessels drawing 7 feet can now pass through the entire length of the improvement, including Choctawhatchee Bar. Increased depth secured, about 3 feet at mean low water. This commerce is so combined with that of the lower Choctawhatchee and Holmes Rivers as to be inseparable, and reference is made to the reports on those streams.

The completed project will probably not materially affect freight rates.

The improvement being completed, no further funds are recommended. The balance available will be expended in office expenses and for replacing worn-out parts of plant used on this improvement.

July 1, 1911, balance unexpended	$23,017.53
June 30, 1912, amount expended during fiscal year, for works of improvement	21,543.39
July 1, 1912, balance unexpended	1,474.14

(See Appendix Q 11.)

12. Blackwater River, Fla.—The river has its source in southern central Alabama, flows in a south-southwesterly direction, and empties into an arm of Pensacola Bay. The section included in the project is about 10 miles in length. The channel had a depth of 8 feet, with varying widths.

The original project for this improvement was adopted March 3, 1899, and provided for securing a channel 9 feet deep from Milton, Fla., to its mouth, at an estimated cost of $20,000. Under this project $5,000 was expended and a channel of the required depth secured in the river proper.

The river and harbor act of March 3, 1905, fixed the width of the channel at 100 feet, and provided for the improvement of Blackwater and upper East Bays, and the Blackwater River, Fla. The estimated cost of completion was $15,000.

The act approved March 2, 1907, provided for improvement and maintenance of Blackwater River only, since which time no modification has been made.

The existing project provides for securing a channel 9 feet deep and 100 feet wide from Milton to the mouth, and is based on the acts of March 3, 1899, and March 3, 1905, the act of March 2, 1907, eliminating the improvement of Blackwater and upper East Bays. The estimates made for this improvement amounted to $35,000.

The existing project, adopted by acts of March 3, 1899, and March 3, 1905, is based on Senate Executive Document No. 11, Forty-seventh Congress, first session; Annual Report of the Chief of Engineers for 1882, page 1309, and covers the section from Whites Point to 12 miles above Milton. (No maps.) The section from the mouth to Milton is based on House Document No. 193, Fifty-eighth Congress, second session; Annual Report of the Chief of Engineers for 1904, page 1792. (No maps.)

Operations during the fiscal year ending June 30, 1912, consisted in dredging to secure the project depth. The amount expended was $23,608.50, $300 of which was applied to maintenance.

The total amount expended on this improvement up to the close of the fiscal year ending June 30, 1912, was $44,887.10, of which about $6,800 was for maintenance.

With funds appropriated by act of March 3, 1905, an 8-inch suction dredge and other plant necessary for doing the work were repaired and dredging was commenced in East Bay near the beacon, about 2 miles below Robinsons Point, and a channel about 80 feet wide and not less than 9 feet deep was dredged for a distance of 4,470 feet toward Robinsons Point. This cut improved the worst part of the channel and increased the available depth over the improvement about 1 foot. In the execution of this work it was found that the area to be dredged over was much larger than indicated by the available charts of the improvement, possibly due in part to fill which has taken place since the surveys for the charts were made. To secure a channel 9 feet deep and 100 feet wide over the remaining shoals within the wide limits covered by the improvement was estimated to require $20,000 in addition to funds available. It is to be noted that in the report upon which the present project is based the doubtful character of the original estimate was recognized and the possibility of a considerable increase was clearly foreseen.

Operations during the fiscal year ending June 30, 1912, resulted in securing a depth of 9 feet and width of 100 feet, in accordance with the approved project, over all but a small portion of the improvement, where there was a depth of but 8½ feet at mean low water. The distance over which dredging was done was 31,672 feet. The project is about 95 per cent completed. Increased depth secured, about 4 feet. The usual variation of the water surface is 2 feet. Head of navigation is at Milton, about 10 miles above the mouth of the river proper.

The commerce of this stream consists of timber, lumber, naval stores, and general merchandise, having an estimated value of $2,000,000 per annum. The dry dock at Bagdad and marine railway at Milton both do a large business. Lumber brought by rail is stored in the bayou near Milton and taken to Pensacola via this river.

The effect of the improvement on freight rates, if any, can not be stated.

No further funds are recommended at this time.

July 1, 1911, balance unexpended		$23,771.40
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$23,308.50	
For maintenance of improvement	300.00	
		23,608.50
July 1, 1912, balance unexpended		162.90

(See Appendix Q 12.)

13. Harbor at Pensacola, Fla.—The available depth across the inner bar at the entrance to this harbor in 1879, previous to any work of improvement, was 19.5 feet, the width of the channel being contracted by the encroachment of the Middle Ground Shoal to the southward. The harbor entrance and channel way were also obstructed by wrecks, and the western shore line in the vicinity of Fort McRee was cutting away rapidly, almost the whole of the old Fort McRee washing away before the erosion was stopped.

The size of Pensacola Harbor is approximately 64 square miles, situated about 40 miles, by water, east of Mobile Harbor.

The project of 1877 considered only the removal of the wrecks; that of 1878 called for the removal of these wrecks and for making a survey to determine further recommendations for improvement. The project of 1881 provided for dredging a channel 300 feet wide and 24 feet deep at mean low water for the temporary relief of navigation, and also for protecting the shore line near Fort McRee, with a view to preventing further injurious changes. Dredging under this project was carried on at various times between 1881 and 1893, and at the close of the dredging operations in August, 1893, the available channel was 225 feet wide and 24 feet deep at mean low water. Two groins, one 360 feet and the other 220 feet long, were completed in 1890 and still serve to hold the shore line near Fort McRee.

In 1891 a special Board of Engineers presented a project for opening a new channel across the Caucus Shoal, following the direction of the ebb current, by means of two jetties, assisted by dredging, if necessary. In 1895 a second special Board of Engineers recommended that no change be made in the project of 1891, but that dredging be tried, using one of the hydraulic dredges belonging to the United States to open up a channel 26 feet deep at mean low water and as wide as practicable on the line of deepest water across the Caucus Shoal and approximately on the line of the axis of the jettied channel proposed by the Board of Engineers in 1891. In December, 1895, this channel was opened by the U. S. dredge *Gedney* to a width of 120 feet and depth of 24 feet at mean low water. It has a length of about 10,000 feet across Caucus Shoal and is now known as the Caucus Channel.

In 1896 the same board that recommended the first amendment to the project of 1891 submitted a second amendment providing for the expenditure of all funds available in continuing the work of dredging across the Caucus Shoal and for building a dredge and opening the channel across the Caucus Shoal 30 feet deep at mean low water to a width of at least 300 feet, with such side slopes as the material would assume, if sufficient funds were made available by Congress. Until a channel should be opened by dredging across the Caucus Shoal, as above proposed, the board recommended that the construction of the jetties for its maintenance be not considered.

The river and harbor act of March 3, 1899, extended this project to "securing a channel depth of 30 feet at mean low water from the Gulf of Mexico to the dock line at the east end of the city of Pensacola."

The amount expended on these projects to June 30, 1905, was $725,956.94. The work done comprises the removal of the wrecks obstructing the channel, dredging a large amount of material from the inner bar, opening and redredging a 30-foot channel across the Caucus Shoal, and the protection of the shore line from erosion by the construction of two groins near old Fort McRee.

The river and harbor act approved June 13, 1902, appropriated $220,000, of which $150,000 might be used in constructing a seagoing suction dredge. This dredge, the *Caucus*, was built and turned over to the district in August, 1905. The same act modified the project, which now provides for dredging a channel 30 feet deep and 500 feet wide from the Gulf of Mexico to the dock line at the east end of the city of Pensacola.

The existing project, adopted June 13, 1902, provides for a channel 30 feet deep and 500 feet wide from the Gulf of Mexico to the dock line at the east end of the city of Pensacola. There is no approved estimate of the cost of this project.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entrance [1]					1879	806
Do.[2]					1881	1176
Do.[1]	House	Ex. 224	Forty-eighth	Second	1885	1606
Do.[1]	do	Ex. 226	Fiftieth	First	1888	1191
Do.[1]					1889	1408
Do.[2]					1891	1713
Do.[1]					1894	1272
Entrance and harbor lines [1]					1896	1389
Entrance [1]					1897	1629
Do.[1]					1898	1401
To quarantine station [1]	House	665	Sixtieth	First		

[1] No maps.

[2] Contains maps.

No work was done during the fiscal year ending June 30, 1912. The amount expended during the year was $2,167, and covered outstanding liabilities of the previous year on account of work of improvement.

Under the existing project there has been expended up to the close of the fiscal year ending June 30, 1912, for dredge construction, $172,221.27, and for the improvement $400,704.08, of which $268,206.22 has been applied to maintenance.

Receipts from sales, $78.23.

The project is about 90 per cent completed.

The dredge *Caucus* commenced dredging September 18, 1905, and at the close of the fiscal year ending June 30, 1911, had removed a total of 3,375,528 cubic yards of material. This work has restored the channel to its original dimensions and widened it and removed the shoaling due to the storm of September, 1906, so that on June 30, 1911, the minimum width of channel having a depth not less than 31 feet at mean low water was approximately 450 feet.

The dredge *Caucus* suspended work on May 23, 1911, leaving for St. Andrews Bay, Fla., to begin dredging operations there.

The maximum draft that could be carried over the improvement at mean low water on June 30, 1912, was 31 feet, and the ordinary range of the tide is about 1.1 feet.

The commerce of this port is very large. For the fiscal year ending June 30, 1903, the foreign exports were reported at $13,741.540, no record of the coastwise exports being available; in 1904, as $15,893,456; in 1905, exports as $15,295,067 and imports as $985,840; in 1906, exports as $18,432,931 and imports as $386,377; in 1907, exports as $20,229,414 and imports as $618,363; in the fiscal year 1908, exports as $20,322,649 and imports as $675,503; in the calendar year 1908, exports as $16,306,056 and imports as $1,188,925; in the calendar year 1909, exports as $20,960,154 and imports as $1,500,801; in the calendar year 1910, exports as $20,489,291 and imports as $2,123,678; and in the calendar year 1911, exports as $20,742,292 and imports as $1,632,734.

The completion of the project will give greatly increased facilities to the large commerce of Pensacola, but will not materially affect freight rates.

It is proposed to apply the available funds in dredging operations toward completion of the project and maintenance of the project depth.

It is not, however, proposed to do any further work until after the dredge *Caucus* has made St. Andrews Bay improvement available under the project, unless the necessities of Pensacola Harbor should demand earlier work.

July 1, 1911, balance unexpended	$73, 820. 18
Received by sale from old material	78. 23
	73, 898. 41
June 30, 1912, amount expended during fiscal year, for works of improvement	2, 167. 00
July 1, 1912, balance unexpended	71, 731. 41
July 1, 1912, outstanding liabilities	1, 719. 59
July 1, 1912, balance available	70, 011. 82

(See Appendix Q 13.)

14. Escambia and Conecuh Rivers, Fla. and Ala.—These two names apply to one and the same stream, which flows through a heavily timbered country in southern Alabama and western Florida into Escambia Bay, an arm of Pensacola Bay. The change of name occurs at the boundary line between the two States. The timber from this district is brought down the river and forms a large part of all that is exported from Pensacola.

The source of this stream is near the town of Union Springs, Ala., the general direction of flow southerly and south, emptying into Escambia Bay, Fla. The length from source to mouth is approximately 300 miles; the length of the section included in the project is 195 miles. Originally the Conecuh River was impassable for boats, being obstructed by snags, marl reefs, and sand bars; even the transportation of timber and sawlogs during high water was difficult. The Escambia River, a continuation of the Conecuh River at the Alabama and Florida line, had a width varying from 150 to 300 feet, with an abundance of water, but was obstructed by snags, log booms, overhanging timber, and a bar at its mouth; this bar interfered seriously with navigation, preventing the entrance of tugs where the rafts were made ready for towing to Pensacola.

The first appropriation for the improvement of this river was made in 1833, and prior to the adoption of the present project $5,000 was expended in removing obstructions. A subsequent appropriation of $5,500, made in 1836, was returned to the surplus fund in 1838. No further appropriations were made until 1880.

(*a*) *General improvement.*—The present project, as originally adopted June 14, 1880, provided for the improvement of the river from its mouth to Indian Creek, Ala., an estimated distance of 293 miles, by the removal of snags, logs, and overhanging trees, by excavating rock shoals, by works of contraction and shore protection, and by dredging a channel 150 feet wide and 5½ feet deep at mean low water through the bar at the mouth, all at an estimated cost of $87,430, but the recent adoption of a separate project for the Conecuh River has, in effect, fixed the upper limit of the improvement as the mouth of Patsaliga Creek.

By act of Congress approved March 2, 1907, a project was adopted for completing the improvement of the Conecuh River from the mouth of Patsaliga Creek to the State line between Florida and Alabama by removal of bowlders, snags, and rock shoals, in accordance with report submitted in House Document No. 159, Fifty-ninth Congress, first session, at an estimated cost of $31,000.

The existing project, adopted June 14, 1880, and modified March 2, 1907, provided for a channel 150 feet wide and 5½ feet deep at mean low water through the bar at the mouth of Escambia River, and for the removal of logs, snags, and overhanging trees, rock excavation, works of contraction, and shore protection, from the mouth of Escambia River to Patsaliga Creek, at an estimated cost of $118,430.

The project has been completed and additional work required is for maintenance.

The existing project is based on report printed in Annual Report of the Chief of Engineers for 1879, pages 843 and 852; also in House Document No, 159, Fifty-ninth Congress, first session. (No maps.)

For report on the section from the mouth to Brewton, see House Document No. 261, Sixty-second Congress, second session, without maps.

Operations during the fiscal year ending June 30, 1912, consisted in snagging and removal of overhanging trees. The amount expended during the year was $5,417.86, all for maintenance.

The amount expended to June 30, 1912, on the project as modified was $178,188.04, largely for maintenance.

These expenditures have kept the river fairly free from snags, opened the channel across the bar at the mouth from time to time, and greatly facilitated the rafting and towing of timber; but due to lack of funds in recent years, the river, which in 1900 was practically free from obstructions from its mouth to near the mouth of Patsaliga Creek, again became so much obstructed as to seriously interfere with the rafting at low-water stages.

The combined project is completed. Increased depth secured, about 3 feet throughout the entire improvement included in the project. Ruling depth in Conecuh River, 2½ feet; in Escambia River, from mouth to Moline, 6 feet; Moline to State line, 3 feet. Plane of reference, mean low water from mouth to about 18 miles above; for remainder of river, low water. Variation of water surface, 0, or low water, to about 30 feet at upper limit of project.

The actual head of navigation during ordinary stages of the river is at the mouth of Patsaliga Creek, about 195 miles above the mouth of the Escambia River.

Commerce consists of timber floated in rafts, the value of which in 1911 is estimated at $2,000,000.

Work completed influences the transportation of timber on 170 miles of river, which has been greatly facilitated, admitting of rafting on stages of water some 3 feet less than formerly. The freight per thousand by rail from River Falls, a point 3 miles below Patsaliga Creek, to water is $1.50; by river, it is 75 cents.

It is proposed to apply the funds available and the appropriation recommended in snaggging and dredging toward maintenance of the improvement.

July 1, 1911, balance unexpended	$7,229.82
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	5,417.86
July 1, 1912, balance unexpended	1,811.96
July 1, 1912, outstanding liabilities	596.26
July 1, 1912, balance available	1,215.70
Amount appropriated by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	6,215.70
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 8,000.00

(See Appendix Q 14.)

15. Alabama River, Ala.—This river is formed by the junction of the Coosa and the Tallapoose, 11 miles below Wetumpka, on the Coosa River, and from this junction to its junction with the Tombigbee to form the Mobile it constitutes a 312-mile link in a waterway 815 miles long, from the Oostenaula and Coosawattee Rivers, Ga., to the Gulf of Mexico.

The river was originally so obstructed by logs, snags, and overhanging trees, and shoals, many with depths of but 2.5 feet, that during the low-water season navigation was practicable by day only. Long detentions were frequent at many of the shoals below Selma, and when the water was unusually low traffic was suspended between Selma and Montgomery for three or four months in the year.

The general direction of flow is southwest. The section included in the project covers the entire river.

The original project, adopted June 18, 1878, for the improvement of this stream provided for securing a low-water channel 4 feet deep and 200 feet wide by removing snags, logs, and overhanging trees; by constructing works of regulation, and by dredging, all at an estimated cost of $229,741. On this project $185,000 was expended, principally in snagging operations and the construction of works of contraction. These expenditures greatly improved the condition of the channel, freeing it from obstructions, and secured a low-water depth of 4½ to 5 feet.

By act of July 13, 1892, the original project was amended to provide for a low-water channel 6 feet deep, which was to be secured in the same general way as contemplated in the original project, and the estimated cost was placed at $386,251, provided that at least $100,000 should be appropriated annually and $10,000 a year thereafter for maintenance.

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[1] Exclusive of amount available for fiscal year 1913.

Under this project there has been expended $711,541.12, largely for maintenance.

The river and harbor act of March 3, 1905, contemplated securing a continuous channel not less than 4 feet deep in the Alabama River by open-channel work.

The river and harbor act of June 25, 1910, modified and extended the project for this improvement in accordance with plan printed in House Document No. 1089, Sixtieth Congress, second session, which provides for extending the present 4-foot channel through the Alabama and Coosa Rivers to Wetumpka.

The existing project, adopted March 3, 1905, and modified June 25, 1910, contemplates securing a continuous channel not less than 4 feet deep in the Alabama River by open-channel work from the mouth to Wetumpka. No estimate for completion. The estimate submitted for the section between Montgomery and Wetumpka, a distance of 28.61 miles, was $36,000, with $5,000 annually for maintenance.

The project adopted March 3, 1905, is based on the river and harbor act of that date; the project adopted June 25, 1910, is based on House Document No. 1089, Sixtieth Congress, second session. (Contains maps.)

References to examination or survey reports and maps or plans not in project document.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to Wetumpka [1]					1876	14
Do.[1]	House	140	Fifty-first	Second	1891	1761
Kings Landing-Elks Bluff [1]					1896	1462
Various bars [1]					1897	1638
Mouth to Wetumpka [1]	House	219	Fifty-eighth	Third	1905	1351
Do.[1]	do	378	Fifty-ninth	First		

[1] No maps.

Operations during the fiscal year ending June 30, 1912, consisted in snagging, dredging, and construction of contraction works at various points.

The amount expended during the year was $75,147.01, of which about $30,000 was expended for maintenance.

Receipts from sales, $95.50.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $786,688.13, of which about $260,000 was expended for maintenance.

The approved project was 55 per cent completed up to June 30, 1912, and the maximum draft that could be carried to Montgomery at low water was about 2½ feet; between Montgomery and Wetumpka, 2 feet.

Increased depth secured, 1½ to 3½ feet below Montgomery; none above Montgomery, no work having been done under the project.

The actual head of navigation at ordinary low water is Wetumpka, on the Coosa River, and the variation of the water level is from 0 to 59 feet at Montgomery.

The commerce of this stream is important, consisting principally of cotton, cotton seed, fertilizers, grain, lumber, shingles, naval stores, staves, and a large quantity of miscellaneous freight of all description, the value of which for the year 1911 is reported at 110,231 short tons, valued at $8,253,948. This, however, is but a part of the freight movement that is affected by the improvement, for the actual shipments by water have been relatively small, and, with a river improved for continuous navigation, it is estimated that at least 100,000 tons of the present all-rail freight movement would either go by river or at river rates, and the resulting saving would be very large. In addition, improved facilities would render possible an actual reduction in rates on freight now carried by river.

During the fiscal year 1909 the municipality of Montgomery established a modern wharf at Montgomery, which permits loading and unloading at any stage of the river. There was one barge line established in 1910 for traffic between Mobile and Montgomery and points along the river. This barge line has since been abandoned.

It is proposed to apply funds available and the appropriation recommended in snagging, dredging, and construction of contraction works in furtherance of the project and in maintenance of the improvement.

July 1, 1911, balance unexpended		$92, 508. 88
From sale of old property		95. 50
		92, 604. 38
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$50, 147. 01	
For maintenance of improvement	25, 000. 00	
		75, 147. 01
July 1, 1912, balance unexpended		17, 457. 37
July 1, 1912, outstanding liabilities		6, 972. 87
July 1, 1912, balance available		10, 484. 50
Amount appropriated by river and harbor act approved July 25, 1912		75, 000. 00
Amount available for fiscal year ending June 30, 1913		85, 484. 50
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 100, 000. 00

(See Appendix Q 15.)

16. Coosa River, Ga. and Ala.—The Coosa is formed at Rome, Ga., by the junction of the Oostenaula and Etowah Rivers, which have their sources in northern Georgia. The general direction of flow of the river is southwesterly to its junction with the Tallapoosa and Alabama Rivers, a distance of about 325 miles. The actual length of the river under improvement is about 211 miles. The project covers the section from Rome, Ga., to its mouth.

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[1] Exclusive of amount available for fiscal year 1913.

The Coosa River has always been navigable for light-draft boats from Rome, Ga., to Greenport, Ala., an estimated distance of 162 miles, and this part of the river is of such a character as to make its improvement by works of contraction and channel excavation entirely practicable, except at Horseleg Shoals, near Rome, Ga., where a lock of low lift is required and is now being constructed.

From Greenport, Ala., to Wetumpka, Ala., a distance of 142 miles, locks and dams are required in conjunction with works of contraction and channel excavation to provide for navigation.

From Wetumpka to the junction of the Tallapoosa River the river is navigable at all seasons.

(*a*) *Coosa River between Rome, Ga., and East Tennessee, Virginia & Georgia Railroad bridge.*—The original project for improvement, adopted August 14, 1876, covered the portion of the river from Rome, Ga., to Wills Creek, in Alabama, at a total estimated cost of $180,000, and provided for a crib and timber lock 200 feet long and 32 feet wide, with a 3-foot lift, and for excavation for a 4-foot channel between Rome and Wills Creek.

The act approved June 14, 1880, appropriated $75,000 for continuing improvement, and it is supposed that the funds expended were based upon the estimate of 1878 of $155,616.23, which provided for three locks between Greenport and Woods Island, at the foot of Ten Island Shoals, with a length of 210 feet and a width of 40 feet, an extreme low-water depth of 4 feet on miter sills, together with a 3-foot channel between Locks Nos. 1 and 3.

The act approved September 19, 1890, based on House Document No. 94, Fifty-first Congress, first session, provided for 5 locks and dams from and including Dam No. 4 to the East Tennessee, Virginia & Georgia Railroad bridge. The estimate provided for locks with a clear length of 280 feet and a width of 52 feet, but the river and harbor act fixed the dimensions at 210 feet between miter sills, with a width of 40 feet. The estimate also provided for a connecting channel 100 feet wide and 4 feet deep at extreme low water, at a total estimated cost of $1,160,491, or a total estimated cost for the entire improvement from Rome to the East Tennessee, Virginia & Georgia Railroad bridge of $1,496,107.23. This act also included improvement of the river from the East Tennessee, Virginia & Georgia Railroad bridge to Wetumpka.

The act approved July 13, 1892, modified the act of September 19, 1890, removing the restrictions as to size of locks on the Coosa River.

The act approved March 3, 1905, restricted the improvement of the upper Coosa River for maintenance of the channel between Rome, Ga., and Lock No. 4, in Alabama.

The act approved March 2, 1907, provided for both improvement and maintenance by open-channel work between Rome and Lock No. 4.

The act approved June 25, 1910, provided for the construction of a lock in Dam No. 4, in accordance with plan printed in House Document No. 1421, Sixtieth Congress, second session, at an estimated cost of $282,000, and for the acquisition of site for Dam No. 5, in Alabama, which was recommended be placed at Choccolocco Shoals, the estimated cost of which was $134,000. This act also provided for the construction of a lock 272 feet over all by 40 feet, with a 9-foot lift, at Mayos Bar, near Rome, Ga., at an estimated cost of $241,039, in accordance with plan printed in House Document No. 1115, Sixtieth Congress, second session, which includes cost of lock and dam, gates, valves, maneuvering gear, etc.

The act approved February 27, 1911, appropriated $150,000 for continuing construction of lock in Dam No. 4, and for the construction of Dam No. 5. This act also authorized the raising of Dam No. 4 an additional 3 feet to provide for development of water power. The franchise is granted the Ragland Water Pawer Co., with the understanding that the work should be paid for by them, to be done under the supervision of the United States, and coordinate with the improvement of the Coosa River under the present project.

The existing project between Rome and Lock 4, adopted August 14, 1876, is for improvement by open-channel work and maintenance thereof, based upon the estimate printed in Annual Report of the Chief of Engineers for 1875 (pt. 2), page 661, and the various modifications, as above stated. The acts approved June 25, 1910, and February 17, 1911, provide for the completion of lock in Dam No. 4, construction of Dam No. 5, and for the construction of a lock and dam at Mayos Bar, near Rome, as provided for in House Documents Nos. 1421 and 1115, Sixtieth Congress, second session. The act of February 27, 1911, also provides for raising Dam No. 4, 3 feet by private parties to provide for water-power development.

During the fiscal year ending June 30, 1912, work consisted in maintenance of the channel between Rome and Lock No. 4, and in continuing construction of Lock No. 4 and lock and dam at Mayos Bar; also in making tests for foundation for Dam No. 5. The amount expended during the fiscal year was $214,533.55, of which $11,105.28 was for maintenance.

To the close of the fiscal year ending June 30, 1912, there had been expended on this section of the Coosa, under the existing project, $1,469,143.79, about $100,000 of which has been applied to maintenance.

The proportion of the approved project accomplished up to June 30, 1912, was as follows: Locks 1, 2, and 3, Coosa River, commenced prior to 1890, have been completed. They are situated, respectively, 0.68 mile, 3.86 miles, and 5.24 miles below Greenport, Ala., and have available lengths of 175 feet and widths of 40 feet.

Lock and Dam 4 (25.89 miles below Greenport), commenced since the adoption of larger dimensions above mentioned, has, together with its appurtenances, been under construction, with desultory appropriations, since 1886, but is now being completed.

Channel improvement has been extended as far down as Dam No. 4, about 200 miles, and navigation is now possible to this point, except at extreme low water, when interruptions occur a short distance above Dam No. 4.

Open-channel work, approximately, 25 per cent completed; lock and dam at Mayos Bar, 50 per cent completed; lock in Dam No. 4, 50 per cent completed.

The ordinary variations of the water surface are, at Rome, Ga., 0 to 30 feet; at Greenport, Ala., 0 to 15 feet; at Wetumpka, Ala., 0 to 50 feet.

Rome, Ga., at the junction of the Oostenaula and Etowah Rivers, is the head of navigation.

On June 30, 1912, the maximum draft that could be carried at ordinary low water between Rome and Lock No. 4 was 3 feet, except at Horseleg shoals, 1½ miles below Rome, over which but 2 feet could be carried; lock now being constructed at Mayos Bar will provide 4 feet over this shoal.

The commerce of this portion of the Coosa consists principally in cotton, cotton seed, fertilizers, timber, lumber, staves, grain, and miscellaneous articles, amounting for the year 1911 to 40,840 short tons, valued at $558,492.

The improvement has resulted in a reduction in railroad rates between points on the river and either Rome or Gadsden of not less than 50 per cent, water rates controlling all shipments to and from the country contiguous to the river.

It is proposed to apply the available balance and the funds recommended in continuing work of improvement and maintenance by open-channel work between Rome and Lock No. 4, and in the completion of lock and dam at Mayos Bar, the lock in Dam No. 4, and construction of Dam. No. 5.

Since the date of preparation of the estimates for the ensuing year, report has been received from the local officer that the additional sum of $30,000 will be required to complete the lock and dam at Mayos Bar and $14,000 to complete Dam No. 5 and the lock in Dam No. 4 in addition to the $67,000 named in the following money statement. These increases are made necessary on account of delays of contractors and difficulties not anticipated when the original estimates were prepared. It is recommended that these additional amounts be appropriated in the next river and harbor act in order that completion of these works need not be deferred for lack of funds.

(*b*) *Coosa River between Wetumpka and East Tennessee, Virginia & Georgia Railroad bridge.*—On account of the numerous rapids this part of the river has never been navigable.

The original and existing project for the improvement of this section of the river, adopted September 19, 1890, as the result of a survey made in 1889 and modified by Congress July 13, 1892, contemplates slack-water navigation and provides for the construction of 23 locks and dams of varying lifts, of an available length of 280 feet and width of 52 feet, with 6 feet over the miter sills, no lift of lock to exceed 15 feet. In addition, the channel is to be cleared of various rock reefs and points so as to give a least depth of 4 feet, all at an estimated cost of $5,106,422.

By act approved March 4, 1907, printed in Public Document No. 247, a franchise was granted the Alabama Power Co. to construct a lock and dam on the Coosa River for the development of water power at the location of Lock and Dam No. 12, as set forth in survey made in compliance with river and harbor act approved June 13, 1902.

By act approved June 25, 1910, printed in House Document No. 1089, Sixtieth Congress, second session, the improvement of the Coosa River from Wetumpka to its junction with the Alabama and Tallapoosa Rivers, about 11 miles below Wetumpka, was combined with that of the Alabama River.

The existing project for this section of the river, adopted September 19, 1890, modified by acts approved March 4, 1907, and June 25, 1910, provides for 23 locks and dams of varying lifts, of an available length of 280 feet and width of 52 feet, with 6 feet over miter sills, no lift of lock to exceed 15 feet. In addition, the channel is to be cleared of various rock reefs and points so as to give a least depth of 4 feet; also for the improvement of the Coosa River from Wetumpka to junction with the Alabama and Tallapoosa Rivers, with a depth of 4 feet; further, to allow the construction by private parties of a lock and dam at site of proposed Dam. No. 12, as set forth in survey report submitted in compliance with act approved June 13, 1902.

Operations during the fiscal year ending June 30, 1912, consisted in care of property at Wetumpka. Amount expended during the fiscal year, $763.23.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $403,743.66, of which about 2 per cent has been applied to maintenance.

The approved project is about 4 per cent completed, resulting in the construction of the lowest lock of the series, known as No. 31, excepting the dam and gates, the excavation of the channel between this lock and the one next above, and the preparation of data and plans for additional locks and dams.

As yet no benefit has been derived from this improvement, and its value is entirely dependent on the completion of the entire system.

The ordinary variation of the water surface at Wetumpka is 0 to 50 feet.

The river is not navigable, and there is no commerce between Wetumpka and the East Tennessee, Virginia & Georgia Railroad bridge.

Provision should be made for the care of the property belonging to the improvement.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Wetumpka to Greenport [1]					1871	561
Wetumpka to S. R. & D. R. R. bridge.[1]	House	Ex. 248	Forty-second	Second	1872	502
Greenport to 74 miles below [1]					1872	536
Whitsenant and Ten Island shoals [2]					1878	762
Wetumpka to S. R. & D. R. R. bridge.[1]	Senate	Ex. 42	Forty-sixth	Third	1881	1221
Lock No. 3 to 24 miles below [1]					1882	1856
Wetumpka to E. T. V. & G. R. R. bridge.[1]					1897	1650
Lock No. 4 to Wetumpka [1]	House	219	Fifty-eighth	Third	1905	1351

[1] No map.

[2] Contain map.

BETWEEN ROME, GA. AND LOCK NO. 4, ALA.

July 1, 1911, balance unexpended	$46,189.43
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	11,868.51
July 1, 1912, balance unexpended	34,320.92
July 1, 1912, outstanding liabilities	376.82
July 1, 1912, balance available	33,944.10
Amount appropriated by river and harbor act approved July 25, 1912	20,000.00
Amount available for fiscal year ending June 30, 1913	53,944.10
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 25,000.00

LOCK AND DAM AT MAYOS BAR, GA.

July 1, 1911, balance unexpended	$187,960.17
June 30, 1912, amount expended during fiscal year, for works of improvement	96,268.68
July 1, 1912, balance unexpended	91,691.49
July 1, 1912, outstanding liabilities	36,774.19
July 1, 1912, balance available	54,917.30
July 1, 1912, amount covered by uncompleted contracts	27,451.29
Amount (estimated) required to be appropriated for completion of existing project	[1] 30,000.00

LOCK NO. 4 AND DAM NO. 5.

July 1, 1911, balance unexpended	$171,983.57
June 30, 1912, amount expended during fiscal year, for works of improvement	106,396.36
July 1, 1912, balance unexpended	65,587.21
July 1, 1912, outstanding liabilities	33,250.82
July 1, 1912, balance available	32,336.39
Amount appropriated by river and harbor act approved July 25, 1912	124,000.00
Amount available for fiscal year ending June 30, 1913	156,336.39
July 1, 1912, amount covered by uncompleted contracts	25,501.61
Amount (estimated) required to be appropriated for completion of existing project	[1] 67,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1904, for works of improvement	[1] 67,000.00

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[1] Exclusive of amount available for fiscal year 1913.

CONSOLIDATED.

July 1, 1911, balance unexpended		$406,133.17
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$202,665.04	
For maintenance of improvement	11,868.51	
		214,533.55
July 1, 1912, balance unexpended		191,599.62
July 1, 1912, outstanding liabilities		70,401.83
July 1, 1912, balance available		121,197.79
Amount appropriated by river and harbor act approved July 25, 1912		144,000.00
Amount available for fiscal year ending June 30, 1913		265,197.79
July 1, 1912, amount covered by uncompleted contracts		25,501.61
Amount (estimated) required to be appropriated for completion of existing project		[1] 67,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 92,000.00

(See Appendix Q 16.)

17. Operating and care of canals and other works of navigation on Coosa River, Ga. and Ala.—Locks Nos. 1, 2, and 3 were open to navigation on June 30, 1890, and have been operated continuously since, except during such periods as it was necessary to close them for repairs and for a period of 10 days in February, 1895, when the canal between Locks Nos. 2 and 3 was frozen over.

The amount expended to the end of the fiscal year ending June 30, 1912, was $200,777.33.

The expenses of operating and care of Locks Nos. 1, 2, and 3 during the fiscal year have been paid from the permanent indefinite appropriation provided for by section 4 of the act of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act approved March 3, 1909.

These expenses amounted to $5,919.78, exclusive of liabilities outstanding on June 30, 1912, of $150.

(See Appendix Q 17.)

EXAMINATION AND SURVEY REQUIRED BY RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

The local officer was also charged with the duty of making a preliminary examination and survey of *Etowah, Coosa, and Tallapoosa Rivers, Ga. and Ala.*, with a view to their improvement for navigation, etc., provided for in the river and harbor act of March 3, 1909, and reports thereon will be duly submitted when received.

EXAMINATIONS AND SURVEY MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and survey required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer.

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[1] Exclusive of amount available for fiscal year 1913.

They were reviewed by the Board of Engineers for Rivers and Harbors pursuant to law and were transmitted to Congress and printed in documents, as indicated:

1. Preliminary examination of Escambia and Conecuh Rivers, Fla. and Ala., up to Brewton.—Report dated May 31, 1911, is printed in House Document No. 261, Sixty-second Congress, second session. The improvement of these streams by the General Government in the manner apparently desired is not deemed advisable at the present time.

2. Preliminary examination of Choctawhatchee Bay, Fla., with a view to securing a deeper channel to the Gulf of Mexico.—Report dated June 12, 1911, is printed in House Document No. 424, Sixty-second Congress, second session. The improvement of this locality by the General Government in the manner apparently desired is not deemed advisable at the present time.

3. Preliminary examination of Chipola River, Fla.—Report dated May 18, 1911, is printed in House Document No. 463, Sixty-second Congress, second session. The improvement of this locality by the United States above Look and Tremble Shoal is not deemed advisable at the present time, but below that point it is worthy of improvement only to the extent contemplated by existing project.

4. Preliminary examination and survey of St. Joseph Bay, Fla., with a view to securing increased depth at the entrance thereto.—Reports dated July 10, 1911, and January 9, 1912, with map, are printed in House Document No. 660, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $40,000 for first construction, provided local interests contribute one-half of the cost thereof ($20,000), is presented.

EXAMINATION OF CARRABELLE BAR AND HARBOR, FLA., REQUIRED BY THE RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Report dated June 17, 1911, on preliminary examination of *Carrabelle Bar and Harbor, Fla., with a view to securing a depth of 21 feet in the channel from the Gulf of Mexico to deep water in St. George Sound by way of East Pass; also for a channel of the same depth from the Gulf to Carabelle*, required by the river and harbor act approved February 27, 1911, was duly submitted by the district officer. It was reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and was transmitted to Congress and printed in House Document No. 622, Sixty-second Congress, second session. The improvement of this locality by the United States in the manner apparently desired is not deemed worthy of being undertaken at the present time.

The local officer was also charged with the duty of making other preliminary examinations and surveys provided for by the river and harbor act of February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. St. Marks River, Fla., from the town of St. Marks to the Gulf of Mexico.

2. Alabama River, Ala., with a view to the construction of a lock and dam between Montgomery and Selma.

IMPROVEMENT OF RIVERS AND HARBORS IN THE MOBILE, ALA., DISTRICT.

This district was in the charge of Maj. C. A. F. Flagler, Corps of Engineers. Division engineer, Lieut. Col. Lansing H. Beach, Corps of Engineers.

1. Mobile Harbor, Ala.—The channel originally had minimum depths of 5½ feet through Choctaw Pass and 8 feet through Dog River Bar at mean low water, and the available draft for purposes of commerce, by way of Spanish River, the best route then available, was limited to the latter depth. The width of channel over a depth of 5½ feet was about one-half mile.

The improved channel in this harbor is 33½ miles long. The harbor consists of 5 miles of Mobile River, with an average width of 900 feet, which is considered the harbor proper. The balance of the channel is in Mobile Bay. Mobile Harbor is about 92 miles from Pensacola Harbor on the east, and about 61 miles from the harbor at Pascagoula, and about 90 miles from Gulfport Harbor on the west.

The improvement of the channel of Mobile Harbor has been progressive. Between 1826, the date of the first appropriation for this work, and 1857 a channel 10 feet deep was dredged through the shoals in Mobile Bay up to the city of Mobile. Between 1870 and 1876 this depth was increased to 13 feet, the channel being dredged to a width of 300 feet through Choctaw Pass and 200 feet through Dog River Bar.

In 1880 a project for a channel 17 feet deep and 200 feet wide was adopted, and appropriations between 1878 and 1886 were applied to the formation of a channel of these dimensions.

In the river and harbor act of August 11, 1888, a project for securing a channel 23 feet deep was adopted, this project being modified by the river and harbor act of September 19, 1890, so as to provide for the formation of a channel 23 feet deep and with a top width of 280 feet from the Gulf of Mexico to the mouth of Chickasaw Creek, above the city of Mobile. Work upon this channel was completed in 1896, subsequent appropriations, up to and including that made by the sundry civil act of July 1, 1898, having been applied to its maintenance.

The total amount expended on these projects was $3,648,630.60, of which about $115,000 is estimated to have been applied to maintenance.

The next project for the improvement of Mobile Harbor was that adopted by the river and harbor act of March 3, 1899, and provided for the formation of a channel 23 feet deep and 100 feet wide at bottom, with appropriate side slopes, from the entrance of the bay to the mouth of Chickasaw Creek. Work on this project continued until its virtual completion on July 12, 1909.

The act of June 13, 1902, made the removal of sunken obstructions part of the maintenance work in Mobile Harbor.

The total amount expended on the above project was $1,896,860.58, of which $610,832.07 was applied to work of maintenance.

The present project was adopted by the river and harbor act approved June 25, 1910, and provides for the formation of a channel 200 feet wide in Mobile Bay and 300 feet wide in Mobile River, with a depth of 27 feet at mean low water, the work to include the straightening of the channel between beacons 22 and 16 and a turning basin 600 feet by 800 feet at the upper end of the improvement. The estimated cost is $1,802,548. The same act stipulated that the work should be completed within a period of four years, and provided that in the discretion of the Secretary of War the work of straightening the channel should not be undertaken until the present channel shall have been dredged to a depth of 27 feet. In the exercise of this discretion the Secretary of War has authorized the excavation of the straight channel as indicated.

The report of the survey upon which this project is based is printed in House Document No. 657, Sixty-first Congress, second session. This document contains no maps.

No modification has ben made in the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Page.	Date of reports.
Mobile Bay and Harbor, Ala.	(1)				(1)	(1)	Nov. 15, 1826
Mobile Harbor, Ala.	(1)				(1)	(1)	Nov. 25, 1852
Do	(1)				(1)	(1)	Aug. 5, 1870
Do	(1)				1879	779	Jan. 7, 1879
From the lower anchorage up to northern limits of Mobile.	(1)				1885	1874	Oct. 22, 1884 Feb. 6, 1885
Mobile Harbor channel, Ala.	House	199	Fifty-fourth	First	1896	1465	Jan. 16, 1896
Do.[2]	do	647	Fifty-ninth	do			Dec. 11, 1905

[1] Not known.

[2] Contain maps.

During the past fiscal year there was dredged from Mobile River, under contract, 1,391,619.5 cubic yards of material, place measurement, resulting in a channel from 140 to 300 feet wide and 25,528 feet long, and the completion of the turning basin at the upper end to the prescribed dimensions of 600 by 800 feet; at the same time there was removed from Mobile Bay, under contract, 4,042,470.5 cubic yards of material, place measurement, resulting in cuts from 135 to 200 feet wide with a total length of 48,056 feet. During the same period the U. S. dredge *Wahalak* dredged 12,641 feet of the cut-off channel in Mobile Bay between beacons 22 and 16, removing a total of 2,921,407 cubic yards of material, place measurement, and making a cut 200 feet wide for that distance; the U. S. dredge *Pascagoula* removed 724,212 cubic yards of material, place measurement, from the lower end of the channel, making a cut 200 feet wide and 7,715 feet long. In all of the foregoing dredging a depth of 27 feet at mean low water was obtained.

During such time as the weather would not permit of the U. S. dredge *Charleston* working on Mobile Bar, she was engaged in dredging at the lower end of the channel, removing 102,746 cubic yards of material, bin measurement, over a distance of 4,347 feet.

There yet remains 25,964 feet of channel upon which no work has been done under the present project.

The total amount expended on the above work was $340,846.06 for the contract work, and $105,932.63 for work of Government dredges.

In addition, a bulkhead 500 feet long by 150 feet wide was constructed in Pinto Pass, Mobile Harbor, under contract, at a cost of $15,301.70; additional piles were driven back of this bulkhead for tying up boats, and fender piles were driven around the bulkhead, at a cost of $185. The U. S. dredge *Wahalak* deposited 21,023 cubic yards of material, place measurement, dredged from the channel in Mobile River, in the bulkhead as filling, at a cost of $1,798.33.

In additon to the expenditures given above, the sum of $32,535.92 was applied to the payment of office expenses and expenses of inspection and surveys.

The snag boat *Demopolis* was engaged in removing sunken obstructions from Mobile Harbor during a large part of the fiscal year, working over 4.2 miles of the channel between the mouth of Three-Mile Creek and the mouth of Mobile River, and removing 3,142 snags, logs, and timbers, at a total cost of $7,095.40.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $826,483.20, of which $8,560.70 was applied to removal of sunken obstructions in maintenance of improvement, $17,285.03 to the construction and filling of bulkhead in Mobile Harbor, and the balance of $800,637.47 to dredging work, including cost of plant. The total amount received from sales to June 30, 1912, was $1,715.17.

Up to the close of the fiscal year 60 per cent of the work under approved project had been completed. The maximum mean low water draft that can be carried over the shoalest part of Mobile Harbor at this time is 22 feet, being practically the same as last year in some of the sections where no dredging has yet been done under the existing project. The average range of tide is about 1½ feet.

Mobile River is navigable at mean low water for vessels of about 14 feet draft up as far as its head, 45 miles above Mobile.

The combined commerce, foreign and domestic, using Mobile Harbor during the calendar year 1911 aggregated 2,203,712 short tons, valued at $59,027,974. Cotton and cotton products, breadstuffs, lumber, and timber were the principal articles of export, and bananas and sisal grass the most important imports.

The effect of the improvement has been to give Mobile quite a large reduction on rail freight rates from Atlantic seaport cities, and to afford direct water freight rates from Mobile to foreign ports.

Available funds and those estimated below will be applied to a continuation of the work of forming a 27-foot channel in accordance with the approved project, which work is necessary to make the improvement available to the depth mentioned, the removal of any shoals forming in the present channel, and the removal of sunken obstructions in maintenance of the improvement.

It is expected that the present project for Mobile Harbor will be completed for about $120,000 in addition to the funds now on hand, thus effecting a saving of about $330,000 from the amount of original estimate for the 27-foot project.

GENERAL IMPROVEMENT.

July 1, 1911, balance unexpended	$701,514.76
June 30, 1912, amount received from sales	80.00
	701,594.76
June 30, 1912, amount expended during fiscal year, for works of improvement	[1] 496,599.64
July 1, 1912, balance unexpended	204,995.12
July 1, 1912, outstanding liabilities	81,892.00
July 1, 1912, balance available	123,103.12
Amount appropriated by river and harbor act approved July 25, 1912	400,000.00
Amount available for fiscal year ending June 30, 1913	523,103.12
July 1, 1912, amount covered by uncompleted contracts	107,305.00
Amount (estimated) required to be appropriated for completion of existing project	[2] 120,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[2] 220,000.00

REMOVING OBSTRUCTIONS.

July 1, 1911, balance unexpended	$10,471.67
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	7,095.40
July 1, 1912, balance unexpended	3,376.27
Amount appropriated by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	6,376.27
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2] 5,000.00

CONSOLIDATED.

July 1, 1911, balance unexpended		$711,986.43
June 30, 1912, amount received from sales		80.00
		712,066.43
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$496,599.64	
For maintenance of improvement	[1] 7,095.40	
		503,695.04
July 1, 1912, balance unexpended		208,371.39
July 1, 1912, outstanding liabilities		81,892.00
July 1, 1912, balance available		126,479.39
Amount appropriated by river and harbor act approved July 25, 1912		403,000.00
Amount available for fiscal year ending June 30, 1913		529,479.39

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[1] Amount expended during fiscal year shown in money statements for *General improvement* and *Consolidated* does not include $421.66 expended for inspection and superintendence of dredging by private parties in Mobile Harbor, which amount was subsequently returned to the United States by said private parties.

[2] Exclusive of amount available for fiscal year 1913.

July 1, 1912, amount covered by uncompleted contracts	$107,305.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 120,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 225,000.00

(See Appendix R 1.)

2. *Mobile Bar, Ala.*—Mobile Bar is located in the Gulf of Mexico off the entrance to Mobile Bay. This bar had a depth of 23 feet at low water over ample width before any work of improvement was commenced upon it. This depth accommodated all the traffic of the Mobile Bay ship channel, but was not sufficient to permit of the utilization of the deep anchorage in lower Mobile Bay beyond the southern limit of the dredged cut leading to the city of Mobile.

The original and existing project for this improvement was adopted in the river and harbor act of June 13, 1902, and provides for the formation of a channel 30 feet deep at low water and 300 feet wide across Mobile Bar, at an estimated cost of $91,250. This work of improvement formed a part of the Mobile Harbor project until March 3, 1905, when by the river and harbor act of that date it was made a separate project, and the limit of cost was increased to $100,000. The channel here is about three-quarters of a mile long, extending from the 30-foot curve on one side of the bar to the 30-foot curve on the other.

The report of the survey on which the project for this improvement is based is printed in House Document No. 219, Fifty-sixth Congress, second session. It contains no maps. It is also printed in the Annual Report of the Chief of Engineers for 1901, page 1854.

No modification has been made in the existing project since its adoption.

The U. S. dredge *Charleston*, borrowed from the Charleston (S. C.) district, commerced work on Mobile Bar on April 22, 1912, and has continued since that date, except when weather conditions prevented. During such periods she worked on the lower part of Mobile Harbor channel. The work on Mobile Bar consisted in the removal of 63,852 cubic yards of material, bin measurement. Expenditures amounted to $4,619.05, or 7.25 cents per cubic yard. When the dredge first reached this work, it was found that the channel had shoaled considerably on the east side, the depth being as little as 16 feet on the crest of the shoal. The work of the dredge is being confined as much as possible to this shoal.

Up to June 30, 1912, the total amount expended on the existing project was $181,770.31, of which $83,770.31 was for maintenance. Amount received from sales, $4.55.

Original work under the project has been about 98 per cent completed, but shoaling has occurred so rapidly and persistently that much maintenance work has been found necessary. The maximum draft that can be carried through the channel is now 25 feet at mean low water, and there is a width of about 150 feet with this depth available. There are some shoals where the depth is less than 25 feet on the east side of the channel, and the work of deepening these shoals is now in progress.

The average range of tide is about 1.1 feet.

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[1] Exclusive of amount available for fiscal year 1913.

For commercial statistics and effect of improvement on freight rates see report on Mobile Harbor.

With the funds estimated as a profitable expenditure in the fiscal year ending June 30, 1914, it is proposed to restore the channel to its full dimensions by use of a Government dredge.

July 1, 1911, balance unexpended	$9,853.29
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	4,619.05
July 1, 1912, balance unexpended	5,234.24
July 1, 1912, outstanding liabilities	3,200.00
July 1, 1912, balance available	2,034.24
Amount appropriated by river and harbor act approved July 25, 1912	10,000.00
Amount available for fiscal year ending June 30, 1913	12,034.24
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]20,000.00

(See Appendix R 2.)

3. Black Warrior, Warrior, and Tombigbee Rivers, Ala.—(*a*) *Black Warrior River.*—This name refers to the section of river above Tuscaloosa. Black Warrior River is formed by the junction of the Mulberry and Locust Forks, 46½ miles above Tuscaloosa. Below Tuscaloosa the same river is called the Warrior, which has a length of 131 miles more to its mouth, near Demopolis, Ala., where it empties into the Tombigbee River. It flows in a general southwesterly direction.

The Black Warrior River was originally closed to navigation on account of shoals at and above Tuscaloosa.

The original project for the improvement was adopted in 1887, the object being to obtain a channel for barges of 6 feet draft at low water all the year around between Tuscaloosa and Daniels Creek, 14½ miles above, by means of five locks and dams, at an estimated cost of $741,670.

Locks Nos. 10, 11, and 12 were built by hired labor and have been completed and opened for traffic since November, 1895.

Lock No. 13 was completed in May, 1905. The river and harbor act of March 3, 1899, provided for the construction of this lock and extended the upper limit of the improvement to the junction of the Mulberry and Locust Forks of the River.

The river and harbor act of March 2, 1907, authorized the construction of Locks Nos. 14, 15, 16, and 17, leaving 18, 19, and 20 to be provided for. It was subsequently decided to build two 21-foot lift locks (Nos. 16 and 17) instead of three 14-foot lift locks on Squaw Shoals, thus reducing the number of locks in the slack-water system necessary to carry the improvement up to the Mulberry and Locust Forks from 20 to 19. Under authority contained in act of Congress approved August 22, 1911, the lift of Lock 17 was changed to 63 feet (flight of two locks to be built here), thus further reducing the number of locks below the Locust and Mulberry Forks to 18, extending slack water to Sanders Ferry, 36 miles above the forks on the Mulberry, and to

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[1] Exclusive of amount available for fiscal year 1913.

Nichols Shoals, 16 miles above the forks on the Locust, and dispensing with one lock on each fork.

Lock No. 14 was completed and opened to navigation in March, 1910, and Lock No. 15 in May, 1910.

The completion of six locks on this river has resulted in affording 6-foot navigation at low water from Tuscaloosa to site of Lock No. 16, 25 miles. The minimum width of channel on this section of river is about 250 feet.

Lock No. 16 is being built under contract dated November 28, 1908, and is about 94½ per cent completed. One lock tender's house has been built, and steel gates for this lock have been built with hired labor and are ready for erection.

The construction of Lock 17 was commenced under a contract dated September 20, 1910, providing for 21-foot lift, but after considerable preliminary work had been done by the contractor the height of the lift to be provided at this dam was changed to 63 feet by action of the Secretary of War under act of Congress approved August 22, 1911. A supplemental agreement was then made with the contractor, under date of January 12, 1912, for construction of 63-foot dam, with two locks and lock tender's house.

The improvement of Black Warrior River is based upon the report of a board of engineers dated April 2, 1887, and published in the Annual Report of the Chief of Engineers for 1887, page 1302.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
River below Locust Fork	House	75	Forty-third	Second	1875	18
River from Tuscaloosa to Sipsey and Mulberry Forks.	(1)		(1)		1881	1218
River from Daniels Creek to Mulberry and Locust Forks.[2]	House	259	Fifty-fourth	First	1896	1461
Mulberry and Locust forks of Black Warrior River.[2]	do	72	Sixty-second	do		

[1] Not known.

[2] Contain maps.

The project as modified provides for slackwater navigation (6-foot depth at mean low water) from Tuscaloosa to Sanders Shoals on the Mulberry Fork, 82½ miles, and to Nichols Shoals on the Locust Fork, 62¼ miles. Recent appropriations having been made for locks and dams on the Black Warrior, Warrior, and Tombigbee Rivers, Ala., as one slackwater system, statement of total figures will be found under the heading *General* on page 616.

Work on the Black Warrior during the past fiscal year was carried on at Locks 16 and 17. At the former lock the contractor removed 56,971 cubic yards of common excavation and 7,814 cubic yards of rock excavation and placed in the work 19 cubic yards of stone filling, 2,135 cubic yards of concrete, 1,007 cubic yards of riprap, hand placed; 10,182 feet b. m. framed timber heart, and 9,449 pounds of valves and special iron. Steel gates for this lock were constructed with hired labor at the Government shops in Tuscaloosa, Ala., and are ready for transportation to the lock for erection. At Lock 17 delivery of material, delivery and installation of plant, preparation of camp, and other preliminary work has been done; lock tender's house erected, and contracts have been made for material, for gates, valves, and special irons. Expenditures on this work amounted to $117,691.91.

The total amount expended on this section of river up to the close of the fiscal year ending June 30, 1912, was $2,209,818.70, none of which was applied to maintenance. Work on this part of the approved project, as modified, has been about 62 per cent completed.

For effect of project on freight rates, see data under heading *General* on page 616, and for commercial statistics, see report on Operating and Cars of Locks.

(*b*) *Warrior River.*—This name refers to the portion of the river from Tuscaloosa to its mouth near Demopolis, Ala., where it empties into the Tombigbee River, 131 miles. The same river above Tuscaloosa is called the Black Warrior. It flows in a southwesterly direction. The minimum width of the channel is about 250 feet. Before any work was done on this section the channel width was limited to 60 feet and depth to 1 foot at mean low water, on account of logs, snags, and overhanging trees.

The original project for the improvement, adopted by the river and harbor act approved March 3, 1875, contemplated deepening the channel by jetty construction and the removal of snags and overhanging trees. The amount expended on this project from 1880 until the adoption of the present project was $319,388.30. Prior to 1880 appropriations aggregating $88,000 were expended on the Warrior and Tombigbee Rivers jointly, and an account of this work may be found in the Annual Report of the Chief of Engineers for 1897, page 1679.

The present project, adopted by the river and harbor act of March 3, 1899, for the construction of six locks and dams (Nos. 4 to 9, inclusive, of the Black Warrior, Warrior, and Tombigbee system), with a total lift of 60 feet, and to afford a channel for barges of 6 feet draft at mean low water all the year round between Demopolis and Tuscaloosa, has been completed, except that some dredging is needed near the upper end of each pool to give the required depth at low water; some snagging and bank work are required, fishways should be provided at three of the dams, and additional lock houses which are being built.

The maximum draft that can be carried over the shoalest place in the channel at low water is 4½ feet, and the minimum width at some of the worst bars is about 50 feet.

For report of survey upon which the original project was based see Annual Report of the Chief of Engineers, 1875, page 18. For report of survey upon which present project is based, see Annual Report of the Chief of Engineers for 1890, page 1719, and House Document No. 156, Fifty-first Congress, first session.

The work of lock and dam construction on this section has been completed at a cost of $2,072,753.88. In addition, $13,691.24 has been applied to maintenance snagging.

The only work on this section during the past fiscal year has been the construction of two lock tenders' houses, partial construction of a third, and preparation for construction of two more, all under contract. The total amount expended on lock tenders' houses during the fiscal year was $6,527.24.

For total amount expended on existing project, effect on freight rates, and total project figures see data given under heading *General* on page 616.

For commercial statistics, see report on operating and care of locks.

(*c*) *Tombigbee River from the mouth to Demopolis* (*construction of locks and dams*).—The Tombigee River rises in the northeastern corner of the State of Mississippi, flows in a southeasterly direction for a length of about 508 miles to its junction with the Alabama River, with which it forms the Mobile River. The section from the mouth to Demopolis is 185 miles in length, and the mouth of the river is 45 miles from Mobile.

For original condition of channel, former projects, and details as to present project, see report on Tombigbee River from the mouth to Demopolis (maintenance of channel) which follows this report. The lock and dam work was adopted by the river and harbor act of September 19, 1890, as part of a project for the improvement of this section, and the river and harbor act of June 13, 1902, made this a part of the project for securing 6-foot navigation all the year round between Mobile and the Warrior coal fields.

This action was based on a survey printed in the Annual Report of the Chief of Engineers for 1890, page 1719, and in House Document No. 156, Fifty-first Congress, first session.

This project has not been modified since the above action.

During the past fiscal year work was carried on under contract at Locks 2 and 3, the principal operations being excavation, placing concrete, and delivering material. Contract work at these two locks has been very slow and unsatisfactory. Expenditures amounted to $201,632.25. At Lock 2 contract work is about 79 per cent completed, and at Lock 3 about 58 per cent. Work on this section under the project is about 73 per cent finished.

The total amount expended on work of lock and dam construction on this section to June 30, 1912, including $11,854.53 for surveys, was $1,196,230.91; for construction of dredge, $40,030; for construction of lock tenders' houses, $18,824.33; and for dredging between locks, $819.86.

This section of river is navigable for a 3-foot draft all the year round except during periods of extreme low water.

For commercial statistics, see report on operating and care of locks.

For total project figures and effect on freight rates, see data included under heading *General*, as follows:

General.—Recent appropriations for slackwatering the Black Warrior, Warrior, and Tombigbee Rivers, Ala., have been made for one system from Mobile to the Mulberry and Locust Forks of the Black Warrior River, 407½ miles. Action taken under act of Congress approved August 22, 1911, extends the upper limit of the project up the Mulberry Fork to Sanders Ferry, 36 miles, and up the Locust Fork to Nichols Shoals, 16 miles. The entire improvement is now considered one project.

The following statement shows the total figures for the present project, as modified, to June 30, 1912:

Total estimated cost of project, including $13,691.24 applied to maintenance work, but not including $3.047.56 received from sales, etc		$8,675,000.00
Total amount appropriated (not including receipts from sales, etc.) to June 30, 1912		[1] 6,920,407.24
Amount authorized, but not yet appropriated	[1] $485,000.00	
Amount required, but not yet authorized or appropriated	1,269,592.76	
		1,754,592.76
Or, in round numbers		1,754,600.00
The following division shows the proposed application of the required $1,754,600:		
For completing locks and dams	$1,624,600.00	
For dredging between locks necessary to secure 6-foot depth	90,000.00	
For removing snags and overhanging trees (original work)	30,000.00	
For building fishways in Dams 7 to 13	10,000.00	
		1,754,600.00
Total amount appropriated, including $3,047.56 received from sales, etc., to June 30, 1912, in all		6,923,454.80
Applied to work of lock and dam construction, including surveys	$5,478,803.49	
Dredging between locks	819.86	
Cost of dredge	40,030.00	
Cost of lock houses to June 30, 1912	25,351.57	
Snagging work (maintenance)	13,691.24	
		5,558,696.16
Balance unexpended June 30, 1912, including outstanding liabilities		[1] 1,364,758.64

The lock and dam work on this project is being performed under continuing contract.

The extension of the project up the Mulberry and Locust Forks of the Black Warrior River, Ala., is based on survey, report of which is printed in House Document No. 72, Sixty-second Congress, first session, which contains maps.

The work of lock and dam construction has thus far had a marked effect on traffic. What effect the all-year-round 6-foot navigation will have when obtained can not be definitely stated until the project is completed, but indications are that it will cause great reduction in freight rates and develop an extensive traffic between the coal fields of western Alabama and the Gulf of Mexico.

Contracts now in force require the completion of all locks and dams in the system not already built by about the middle of August, 1914, and all lock tenders' houses during the present fiscal year. It is proposed, also, to complete all the dredging between locks, removal of obstructions, and bank work, necessary to secure 6-foot depth, and the building of fishways at Locks 7 to 13, inclusive, by the time the locks and dams are completed. The entire amount not yet appropriated is therefore given below as that estimated as a profitable expenditure in fiscal year ending June 30, 1914, and includes $485,000 authorized but not yet appropriated.

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[1] As affected by sundry civil act of Aug. 24, 1912.

LOCK HOUSES.

July 1, 1911, balance unexpended	$11,175.67
Amount allotted from appropriation for locks and dams	25,000.00
	36,175.67
June 30, 1912, amount expended during fiscal year, for works of improvement	6,527.24
June 1, 1912, balance unexepended	29,648.43
July 1, 1912, outstanding liabilities	2,050.00
July 1, 1912, balance available	27,598.43
July 1, 1912, amount covered by uncompleted contracts	9,000.00

DREDGING BETWEEN LOCKS.

Amount allotted from appropriation for locks and dams	$10,000.00
June 30, 1912, amount expended during fiscal year, for works of improvement	819.86
July 1, 1912, balance unexpended	9,180.14
July 1, 1912, outstanding liabilities	500.00
July 1, 1912, balance available	8,680.14
Amount (estimated) required to be appropriated for completion of existing project	[1] 90,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 90,000.00

LOCKS AND DAMS.

July 1, 1911, balance unexpended	$1,215,224.23
June 30, 1912, received from sales	30.00
	1,215,254.23
Less amount allotted for lock houses and dredging between locks (shown above)	35,000.00
	1,180.254.23
June 30. 1912. amount expended during fiscal year, for works of improvement	[2] 319,324.16
July 1, 1912. balance unexpended	860,930.07
July 1. 1912, outstanding liabilities	83,000 00
July 1, 1912, balance available	777.930.07
Amount appropriated by sundry civil act approved Aug. 24, 1912	465,000.00
Amount available for fiscal year ending June 30, 1913	1.242,930.07
July 1, 1912, amount covered by uncompleted contracts	2,502,000.00
Amount of continuing-contract authorization, act of June 25, 1910	500.000.00
Amount of continuing-contract authorization, act of Feb. 27, 1911	700,000.00
	1,200,000.00
Amount appropriated under such authorization	715.000.00
Amount yet to be appropriated	485,000.00

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[1] Exclusive of the balance unexpended July 1. 1912.

[2] Does not include $12 expended for the Isthmian Canal Commission and subsequently returned to this appropriation.

Amount (estimated) required to be appropriated for completion of existing project	[1] 1,664,600.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] [2] 1,664,600.00

CONSOLIDATED.

July 1, 1911, balance unexpended	1,226,399.90
June 30, 1912, received from sales	30.00
	1,226,429.90
June 30, 1912, amount expended during fiscal year, for works of improvement	[3] 326,671.26
July 1, 1912, balance unexpended	899,758.64
July 1, 1912, outstanding liabilities	85,550.00
July 1, 1912, balance available	814,208.64
Amount appropriated by sundry civil act approved Aug. 24, 1912	465,000.00
Amount available for fiscal year ending June 30, 1913	1,279,208.64
July 1, 1912, amount covered by uncompleted contracts	2,511,000.00
Amount of continuing-contract authorization, act of June 25, 1910	500,000.00
Amount of continuing-contract authorization, act of Feb. 27, 1911	700,000.00
	1,200,000.00
Amount appropriated under such authorization	715,000.00
Amount yet to be appropriated	485,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 1,754,600.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] [2] 1,754,600.00

(*d*) *Tombigbee River from the mouth to Demopolis* (*maintenance of channel*).—For length and direction of flow of this stream see (*e*), following this report. This section is 185 miles long.

The original condition of the channel of this portion of the river was such as to permit of steamboat navigation during high-water stages only, lasting about six or eight months of the year. The minimum width of the channel was about 100 feet and the minimum depth 2 feet at mean low water.

The original project for the improvement of this stream, as adopted in 1871, contemplated the removal of snags and other obstructions in the channel of the river and the widening and deepening of the existing channel through various shoals, at an estimated cost of $21,500. The project adopted in 1879 was to afford a channel of navigable width and 4 feet deep at ordinary low water from the mouth to Demopolis, a distance of 185 miles, by the removal of snags, logs, and overhanging trees, and the improvement of the worst bars by dredging.

The earlier projects for the improvement of this section of Tombigbee River were superseded by the project adopted in the river and harbor act of September 19, 1890. The project adopted at that time provided for securing a channel 6 feet deep at low water between the mouth and Demopolis by the construction of locks and dams and bank revetments, and by the removal of logs, snags, and other obstructions. The cost of this project was originally estimated at $508,808.98, but in 1897, after $330,000 had been appropriated for the work, the estimate was increased, the additional cost of completion being then placed at $600,000.

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[1] Exclusive of amount available for fiscal year 1913.

[2] Of this amount $485,000 is covered by continuing-contract authorization provided by the act of 1911.

[3] Does not include $12 expended for Isthmian Canal Commission and subsequently returned to appropriation.

By the river and harbor act of June 13, 1902, the formation of a 6-foot channel below Demopolis by constructing locks and dams was made a part of the project for securing 6-foot navigation in the Black Warrior, Warrior, and Tombigbee Rivers, Ala. Information in regard to work accomplished on the Tombigbee River under this project and the expenditures made in connection therewith will be found in the section of this report immediately preceding.

Under previous projects this section of the Tombigbee River has been repeatedly cleared of snags, dikes have been constructed, dredging has been done at the worst bars, and the channel made navigable for steamboats at low stages of the river.

Prior to commencement of work under the existing project there was applied to channel work on this section of river $249,542.48.

The existing project for improvement of the Tombigbee River from the mouth to Demopolis was adopted by the river and harbor act of June 13, 1902, and contemplates the maintenance of the existing channel by the removal of logs, snags, and other obstructions from the stream, and by the repair of dikes.

The present project for snagging, as well as that for lock and dam construction, is based on a survey, report of which is dated December 24, 1889, and is printed in Annual Report of the Chief of Engineers for 1880, page 1719, and in House Document No. 156, Fifty-first Congress, first session. This document contains no map. This survey appears to be the only one ever made of this section of river.

Expenditures during the past fiscal year amounted to $11,251.84, which was applied to the removal of 22,519 overhanging trees and sunken obstructions, as well as payment of office and engineering expenses. Work was restricted to maintenance of the improvement.

The total amount expended under the existing project to June 30, 1912, was $79,420.68, all of which was applied to maintenance. Total amount received from sales to same date was $213.24.

The work done has resulted in affording a channel navigable for steamboats drawing not more than 3 feet all the year round, except during periods of extreme low water, and since Lock 1 was opened to traffic in September, 1908, there has been a 6-foot channel all the year to a point 190 miles above Mobile.

Floods at Demopolis rise at times to a stage of 60 feet above low water.

Commerce on this section during the fiscal year ending June 30, 1912, amounted to 149,900 short tons, principally logs, lumber, cotton, fertilizer, and general merchandise, valued at $3,930,516.31.

This project has directly resulted in affording water and lower rail rates from Mobile to points on the river below Demopolis, Ala.

Available funds and future appropriations will be applied to maintenance of the existing channel and placing the river in good condition before completion of the dams at Locks 2 and 3.

July 1, 1911, balance unexpended	$20,817.96
June 30, 1912, received from sales	2.75
	20,820.71
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	11,251.84
July 1, 1912, balance unexpended	9,568.87
July 1, 1912, outstanding liabilities	1,300.00
July 1, 1912, balance available	8,268.87
Amount appropriated by river and harbor act approved July 25, 1912	10,000.00
Amount available for fiscal year ending June 30, 1913	18,268.87
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]12,500.00

(*e*) *Tombigbee River from Demopolis, Ala., to Columbus, Miss.*—The Tombigbee River rises in the northeastern corner of the State of Mississippi, and flows in a southeasterly direction to its junction with the Alabama River in the formation of the Mobile River. It is about 503 miles long. The section of river from Demopolis to Columbus is 149 miles in length. Demopolis, the lower limit, is 230 miles from Mobile by river. The fall in the river between Demopolis and Columbus is 108 feet.

The original condition of this section of the river was such as to admit of navigation only during high-water stages. The channel was obstructed by shoals, logs, and overhanging trees, the minimum depth being 1 foot at mean low water and the minimum width of channel 70 feet. The improvement of the Tombigbee River between Demopolis and Columbus was commenced under the project of 1871, which contemplated the improvement of this stream by the removal of snags and other obstructions in the river and the widening and deepening of existing channels through various bars. In 1879 this project was modified so as provide for the formation of a channel of navigable width and 3 feet deep at low water from Demopolis to Columbus, this section forming a part of two different improvements.

Prior to adoption of the present project, $63,382.98 was expended on this section of the river.

The present project for improvement of this section of Tombigbee River, adopted in 1890, provides for securing a channel 6 feet deep at low water from Demopolis to Columbus, a distance of 156 miles, by snagging, tree cutting, bank revetment, bar improvement, and the construction of locks and dams, at a cost originally estimated at $779,400. In 1897 the construction of locks and dams was estimated to cost $2,000,000. This project was adopted by the river and harbor act of September 19, 1890, but no provision has yet been made by Congress for commencing the work of lock and dam construction.

Report on the survey upon which the present project is based is printed in House Document No. 156, Fifty-first Congress, first session. This document contains no map. This report is also printed in the Annual Report of the Chief of Engineers for 1890, page 1719. This section of river was at that time divided into two parts, one from Demopolis to Vienna, and the other from Vienna to Cotton Gin, or Columbus.

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[1] Exclusive of amount available for fiscal year 1913.

An examination was made of this section of river in 1905, and report thereon, dated December 9, 1905, is printed in House Document No. 334, Fifty-ninth Congress, second session. It contains no map.

The existing project therefore provided for a channel 6 feet deep at mean low water, to be obtained by snagging, tree cutting, bank revetment, bar improvement, and the construction of locks and dams.

The new self-propelling U. S. snag boat *Vienna* commenced her maiden trip in June, 1911, and began snagging work at Demopolis, Ala., July 1, 1911, working upstream until December 8, 1911, when work was stopped, due to the near exhaustion of funds. The distance worked over was 136½ miles, removing 12,361 obstructions at a total cost of $7,826.25, all this work being in maintenance.

Only the snagging work of this project has been undertaken, as no appropriations have been made for the construction of locks and dams. No surveys have been made for location of locks upon which to base definite estimate of their cost, so that the percentage of completion of project can not be given.

The total amount expended on work under the existing project up to the close of the fiscal year ending June 30, 1912, was $198,040, of which $97,583.11 was applied to maintenance. Amount received from sales, $40.

The maximum draft that can be carried over this locality on June 30, 1912, is 2 feet at mean low water. The extreme oscillation of the river at Demopolis, Ala., is 69 feet, high-water stages ranging from 50 to 60 feet above mean low water.

This entire section of Tombigbee River is open to steamboat navigation throughout the year, except during the period of extreme low water in the fall of the year. At present the regular packet steamers out of Mobile navigate this part of the river during the winter and spring seasons, and it is reported that one steamboat line intends to build a light draft steamer to operate the balance of the year.

Commerce on this section during the calendar year 1911 amounted to 45,399 short tons, valued at $503,086, being principally cotton, cotton seed, fertilizer, hardware, logs, staves, and miscellaneous.

The project results in affording lower rail rates from Mobile to Points on the Tombigbee River above Demopolis for several months each year.

With the funds estimated as a profitable expenditure during the fiscal year ending June 30, 1914, it is proposed to carry on work of snagging and bar improvement from Demopolis upstream.

July 1, 1911, balance unexpended	$7,826.25
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	7,826.25
Amount appropriated by river and harbor act approved July 25, 1912	8,000 00
Amount available for fiscal year ending June 30, 1913	8,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 15,000.00

(*f*) *Tombigbee River from Columbus to Walkers Bridge, Miss.*—For length and direction of flow of the Tombigbee River see report on section Demopolis to Columbus (*e*), preceding. The section from Columbus to Walkers Bridge is 169 miles long. The fall in this section of river is not definitely known. Columbus, the lower limit, is 334 miles from the mouth of the river.

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[1] Exclusive of amount available for fiscal year 1913.

Prior to 1902 this improvement was divided into two sections, one from Columbus to Fulton, 144 miles, and the other from Fulton to Walkers Bridge, 25 miles, for which appropriations were made separately.

The original condition of the river was such that navigation was impossible except at high water and difficult even at that stage, owing to the logs, snags, and overhanging trees which obstructed the channel. The minimum depth in the channel was about 1 foot at mean low water and the minimum width was 50 feet.

The project for the improvement of the river above Columbus was adopted in 1873, and provided for obtaining a good high-water channel by the removal of obstructions, at an estimated cost of $35,000. This project was completed in 1882, at a cost of $27,293.65, since which time operations have been directed toward maintaining the improvement. The first specific appropriation for the portion of the river between Fulton and Columbus was made in 1892, this money, together with subsequent appropriations, being applied to the maintenance of a high-water channel.

The project for improvement of the river from Fulton to Walkers Bridge was adopted in 1888, and provides for securing a high-water channel by the removal of logs, snags, and overhanging trees, at an estimated cost of $11,000, and for the maintenance of the same at an annual cost of $1,500. This project was adopted by the river and harbor act of August 11, 1888, and was completed in 1891, at a cost of $6,517.19.

Survey of Tombigbee River from Fulton to Columbus was made in 1873, and reference to report thereon is contained in Annual Report of the Chief of Engineers for 1892, page 1448. Report on an examination of the river from Fulton up to Warrens Mill (Walkers Bridge) is printed in the Annual Report of the Chief of Engineers for 1882, page 1312.

The existing project for this section of river provides for maintaining a high-water channel by the removal of snags, logs, and overhanging trees.

No work was done on this section of river during the past fiscal year. Expenditures amounted to $3,251.05, and were applied to care and repair of plant and the payment of office expenses and incidentals.

An examination of this section of river was made in November and December, 1910, and revealed the fact that the river from Walkers Bridge down to Aberdeen, Miss., was not susceptible of improvement at a reasonable cost, considering the benefits to be derived and the commerce involved. It was therefore recommended by the district engineer and the division engineer that the improvement above Aberdeen, Miss., be abandoned. This recommendation was concurred in by the Board of Engineers for Rivers and Harbors, and under date of April 14, 1911, the Chief of Engineers directed that work on this section, with funds available, be restricted to improvement at and below Aberdeen.

The channel from Columbus to Aberdeen, Miss., about 50 miles, has a maximum mean low-water depth of about 2 feet in the shoalest part, but is considerably obstructed by snags and logs. At Columbus the river rises as much as 46 feet above low water. Above Aberdeen the river is used almost exclusively for rafting, for which purpose it is available at high stages. It is believed that the improvement of the Tombigbee River above Aberdeen should be abandoned, and the improvement from Columbus to Aberdeen, Miss., be merged with the improvement of this river from Columbus, Miss., to Demopolis, Ala., making one improvement of the two sections, and that appropriations should be made accordingly.

The total amount expended on improvement of this section of river up to the close of the fiscal year ending June 30, 1912, was $90,120.55, of which $56,309.71 was for maintenance.

Commerce on this section during the calendar year 1911 amounted to 1,080 short tons of logs and 1,346 short tons of general merchandise, valued at $30,145.

The project has had no effect on freight rates.

With available funds and future appropriations it is proposed to maintain a high-water channel by removal of sunken obstructions and overhanging trees.

July 1, 1911, balance unexpended	$3, 797. 55
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	3, 251. 05
July 1, 1912, balance unexpended	546. 50
July 1, 1912, outstanding liabilities	259. 99
July 1, 1912, balance available	286. 51

(See Appendix R 3.)

4. *Operating and care of locks and dams on Black Warrior and Tombigbee Rivers, Ala.*—(*a*) *Lock 1.*—This lock is 111 miles above Mobile. It was opened to traffic September 6, 1908, but was not entirely completed until September 30, 1909. At that time its operation and care became a charge under the general law of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909. During the past fiscal year derrick stone was placed on the apron of the dam to prevent scour, over about 250 feet (one-half) of the spillway of the dam, and quarry refuse and earth were placed on the upstream side of dam an equal distance for its protection. Flood deposits and drift were removed from the lock chamber and approaches.

(*b*) *Lock 4.*—This lock is near Demopolis, Ala., about 231 miles above Mobile. Construction work was completed and the lock was opened for traffic on December 1, 1908. At that time its operation and care became a charge under the general law of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909. The lock has been used regularly since that time whenever the stage of river below allowed boats to reach Demopolis. Flood deposit has been removed from the lock and approaches. Some grading has been done on bank slopes. Telephone line has been extended across the river to new lock house. Considerable stone has been filled below dam and an apron of derrick stone about 30 feet wide has been built across the river immediately below the dam.

(*c*) *Lock 5.*—This lock is about 246 miles above Mobile. Construction work was completed and this lock opened to traffic September 1, 1908. At that time its operation and care became a charge under the general law of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909. A large amount of flood deposit has been removed from the lock chamber and approaches. The bank below dam abutment has been graded and protected by riprap stone. Additional stone has been filled below dam to check erosion and an apron of derrick stone has been built across the river immediately below the dam.

(*d*) *Lock 6.*—This lock is about 267 miles above Mobile. Construction work was completed and the lock opened to traffic on October 1, 1908. At that time its operation and care became a charge under the general law of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909. A large amount of flood deposit has been removed from the lock chamber and approaches to lock; banks have been graded and sodded; lock tender's house has been repaired and painted; river crossing for telephone line has been rebuilt with high poles.

(*e*) *Lock 7.*—This lock is about 282 miles above Mobile. Contract work was completed and the lock turned over to the United States November 7, 1903. At that time its operation became a charge under the general law of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909. New oak miter posts have been placed on lock gates. A large amount of flood deposit has been removed from lock chamber and approaches to lock. Additional stone has been filled below dam to check erosion.

(*f*) *Lock 8.*—This lock is about 298 miles above Mobile. Contract work was completed and this lock turned over to the United States in December, 1902. On January 1, 1903, its operation and care became a charge under the general law of July 5, 1884, an amended and reenacted by section 6 of the river and harbor act of March 3, 1909. New oak miter posts have been placed on lock gates. Flood deposit has been dredged from lock and approaches. Lock mound has been enlarged. Telephone line has been extended across river on high poles to new lock house. Bank along upper approach to lock has been protected with riprap. Stone has been delivered for riprap protection of bank below dam abutment.

(*g*) *Lock 9.*—This lock is about 315 miles above Mobile. Contract work was completed and the lock turned over to the United States in December, 1902. On January 1, 1903, its operation and care became a charge under the general law of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909. New oak miter posts were placed on lock gates. Stone filling was placed around guard cribs, which were being undermined by the current. Lock mound was enlarged and protected with riprap. Temporary house was built on lock mound to take the place of house which was burned on abutment side of river. Telephone line extended across river on high poles to lock house. A large amount of flood deposit removed from lock and approaches.

(*h*) *Locks 10, 11, and 12.*—These locks and dams are near Tuscaloosa, Ala., about 363 miles above Mobile, and overcome the Tuscaloosa Falls with their combined lift of 29 feet. They were finished and opened for traffic in November, 1895, and on July 1, 1896, their operation and care became a charge under the general law of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909. Riprap bank protection has been extended below Locks 10 and 11. Quarry waste has been filled above Dam No. 12 to reduce leakage. Minor repairs have been made to gates and valves.

(*i*) *Lock 13.*—This lock is about 9 miles above Tuscaloosa and about 370 miles above Mobile. It was completed and opened for traffic on July 4, 1905, when its operation and care became a charge under the general law of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909. Lock grounds have been graded. Minor repairs made to lock gates and valves.

(*j*) *Lock 14.*—This lock is about 12 miles above Tuscaloosa, Ala., and about 373 miles above Mobile. It was completed and opened to traffic on March 29, 1910, at which time its operation and care became a charge under the general law of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909. Lock was pumped out for repairs to gates and valves. Lock grounds have been graded.

(*k*) *Lock 15.*—This lock is about 19 miles above Tuscaloosa and about 380 miles above Mobile. It was completed and opened for traffic on May 2, 1910, at which time its operation and care became a charge under the general law of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909. Considerable improvement has been made to lock grounds, and minor repairs have been made to gates and valves of lock.

(*l*) During the past year, in addition to work on the locks, the snag boat *R. C. McCalla* worked over the river from Tuscaloosa to Demopolis, removing the worst snags and obstructions and doing some bank work. The dredge *Chas. Humphreys* has worked over practically the same part of the river, cleaning out flood deposit from locks and approaches and cutting channels through the worst bars. The towboat *Nugent* was used for delivering stone and other material to the locks. The derrick on snag boat *R. C. McCalla* was rebuilt, and this boat was hauled out on ways for minor repairs. Repairs were made to machinery and cabin of towboat *Nugent* and two new staterooms added. Repairs were made to machinery of dredge *Chas. Humphreys* and new canvas roof placed on this boat. New derrick boat *Tallahatta* was completed. New motor launch *Mulberry* was purchased and delivered. New boiler plant was installed at Tuscaloosa shops, and all boilers in use on this river tested. Towboat *Sylph* and 10 work barges were hauled out on ways and thoroughly repaired during year. Two work barges now on ways being repaired. To June 30, 1912, the total amount expended on this work was $842,867.84.

The total amount expended during the past fiscal year for operating and care of the 13 locks was [1] $135,396.26.

The total amount of commerce using the locks during the fiscal year ending June 30, 1911, was 424,949 short tons, while that for the fiscal year ending June 30, 1912, was 414,114 short tons, principally coal, stone, corn, cotton, logs, staves, and general merchandise. In addition to this there was considerable traffic in logs in the pool between Locks 4 and 5, and considerable coal was handled on the pool between Locks 12 and 13.

(See Appendix R 4.)

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[1] Does not include $127.53 expended in repair of Lock 5, Black Warrior River, Ala., damaged by boat owned by private parties, which amount was subsequently returned to the United States by said private parties.

5. Channel between Mobile Bay and Mississippi Sound, Ala.—Originally there was a depth on the shoal between Mobile Bay and Mississippi Sound of 3 feet and a width of 500 feet at mean low water.

The proposed channel follows Pass aux Herons, which lies betwen Mobile Bay and Mississippi Sound, about 27 miles south of Mobile Harbor and about 29 miles east of Pascagoula River, Miss.

The act of Congress approved March 23, 1828, appropriated $18,000 for purpose of forming a channel through this pass. Some work was done with these funds, but there appears to be no record of the amount expended or the results accomplished.

The present project, adopted by the river and harbor act of July 25, 1912, provides for a channel 100 feet wide at bottom and 10 feet deep at mean low water, to extend from Mobile Bay to Mississippi Sound, about 2¼ miles, at an estimated cost of $49,359.90. The examination and survey report upon which this project is based is printed in House Document No. 967, Sixtieth Congress, first session, and contains a map. Report of previous examination and survey of this pass may be found in the Annual Report of the Chief of Engineers for 1884, page 1228.

The river and harbor act of July 25, 1912, appropriated $50,000 for this work, which will be applied to dredging out the channel during the current fiscal year.

No work was done during the past fiscal year, no funds being available.

The maximum draft that can be carried over this channel on June 30, 1912, at mean law water is 3 feet. The average range of tide is about 1½ feet.

Nearly all the commerce uses Grants Pass at this time, which is only a short distance from Pass aux Herons, but Grants Pass is owned by private parties and tolls are charged for its use.

The project when completed will result in affording a saving in freight rates and a better channel between Mobile and points on the Gulf coast to the west.

The amount estimated below as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to maintenance of channel to be dredged during the current fiscal year.

Amount appropriated by river and harbor act approved July 25, 1912	$50,000
Amount available for fiscal year ending June 30, 1913	50,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 8,000

(See Appendix R 5.)

6. Pascagoula River, Miss.—Before this improvement was commenced the channel through the bar at the mouth of the river had a least depth of 3 feet at mean low water, the width being 1,000 feet, while inside the mouth for a distance of 10 miles upstream the river was navigable for vessels of 6½ feet draft.

The harbor proper is from 300 to 700 feet wide and about 11 miles long, extending from the mouth of Pascagoula River to a point 4 miles up Dog River. It is about 61 miles distant by water from

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[1] Exclusive of amount available for fiscal year 1913.

Mobile on the east and about 44 miles from Gulfport, Miss., on the west.

Appropriations for this work of improvement were made in 1827, 1828, and 1852, but there is no record of the work accomplished with those funds.

The first extended project for the improvement of this stream was adopted in 1880 and contemplated securing a channel 7 feet deep and 200 feet wide across the bar at the mouth of the river. This project also included some snagging work on the river above Moss Point, which is described in the report on the improvement of the Pascagoula, Leaf, and Chickasahay Rivers, Miss. The project for a 7-foot channel was practically completed in 1884, the total amount expended in securing such a channel, including the appropriations made between 1827 and 1852, amounting to $74,500.

In 1886 a new project was adopted, which provided for securing a channel 12 feet deep at low water, with a navigable width, between Mississippi Sound and Moss Point. Under this project a depth of 9 feet across the entrance bar was first obtained, while subsequently a channel 12 feet deep and 80 feet wide was dredged from Moss Point to the mouth of the river, and a 12-foot channel across the bar at the mouth was partially completed. These operations required the expenditure of $87,317.60, excluding the expenditure of $7,682.40 applied to dredging work in Horn Island Pass in 1897, or a total of $161,817.60 under both projects.

The existing project for the improvement of Pascagoula River was adopted in the river and harbor act of March 3, 1899, and provided for the formation of a 12-foot channel from a point in Dog River 3 miles above its mouth down the Pascagoula River to the 12-foot contour in Mississippi Sound, 150 feet wide above and 300 feet wide below the railroad bridge at Scranton (Pascagoula), Miss., at an estimated cost of $317,600, including the formation of a 20-foot channel through certain shoal spots in the Horn Island anchorage. This project is based on survey dated December 28, 1896, printed in Annual Report of the Chief of Engineers for 1897, page 1718, and House Document No. 211, Fifty-fourth Congress, second session, which contains a map.

Work under this project was in progress between September, 1899, and February, 1902, during which time an uninterrupted 12-foot channel was obtained within the limits of the project in Pascagoula River, while a 20-foot channel was formed through the shoal areas in Horn Island anchorage.

The river and harbor act of June 13, 1902, modified and extended the existing project so as to provide for a channel 17 feet deep instead of 12 feet from 3 miles above the mouth of Dog River to Mississippi Sound, at a total cost of $1,050,222, exclusive of the Horn Island improvement.

The river and harbor act approved June 25, 1910, further modified the project for this improvement by extending the upper limit about 1 mile farther up Dog River, increasing the total cost of the project by $8,000. This action was based upon a survey the report of which is printed in House Document No. 642, Sixty-first Congress, second session. This document contains no map.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		Date of report.
	House or Senate.	No.	Congress.	Session.	Year.	Page.	
Entrance to Pascagoula River.	House	84	Not known	....	1874	754	Oct. 15, 1873
From mills at Moss Point to 12-foot contour in Mississippi Sound, about 11 miles.	do	83	Forty-ninth	First	1886	1215 1216	Oct. 17, 1884 Jan. 30, 1886
From 4 miles up in Dog River down this river and Pascagoula to deep water in Mississippi Sound.[1]	do	682	Sixty-second	Second	....	....	Sept. 30, 1910 Dec. 27, 1911

[1] Does not contain map.

The existing project with all modifications incorporated provides for a channel 17 feet deep and 150 feet wide from a point on Dog River 4 miles above its mouth down Dog River and Pascagoula River to the railroad bridge at Pascagoula, Miss. (formerly Scranton); thence 17 feet deep and 300 feet wide to the deep water in Mississippi Sound.

The U. S. dredge *Pascagoula* worked here from September 16, 1911, to March 16, 1912, removing 1,097,272 cubic yards of material from 25,497 feet of channel below the railroad bridge at Pascagoula; 102,910 cubic yards of material from 7,968 feet of channel above said bridge, and 15,697 cubic yards of material from the United States slip on the west side of Pascagoula River and approach thereto. The channel below the bridge was dredged to 225 feet, while above the bridge 150 feet was the width made. All measurements were in place and the depth obtained was 17 feet at mean low water. All this work was for purpose of maintenance of improvement. Expenditures amounted to $54,624.96.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $840,004.81, excluding the expenditure of about $88,000 on the work performed at Horn Island. Of this amount, $233,543.20 was applied to maintenance. Amount received from sales, $53.90.

Up to the end of the fiscal year 85 per cent of the approved project had been acomplished, resulting in the completion of channel to project dimensions above the railroad bridge at Pascagoula, Miss., and the dredging of that part below the bridge to project depth for a width of 225 feet. The maximum draft that can be carried over the shoalest part under improvement is 17 feet at mean low water. The average range of tide is about 1½ feet.

The commerce of this harbor for the calendar year ending December 31, 1911, amounted to 972,944 short tons, principally logs, lumber, and naval stores, valued at $6,560,380.

The project results in effecting a reduction in rail freight rates between Pascagoula, Miss., and seaboard cities of the Atlantic coast, and also in affording direct water freight rates on lumber from Moss Point and Pascagoula to foreign ports.

It is proposed to apply the funds estimated as a profitable expenditure in fiscal year ending June 30, 1914, to maintenance of the improvement.

July 1, 1911, balance unexpended	$62, 274. 05
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	54, 624. 96
July 1, 1912, balance unexpended	7, 649. 09
July 1, 1912, outstanding liabilities	700. 00
July 1, 1912, balance available	6, 949. 09
Amount appropriated by river and harbor act approved July 25, 1912	20, 000. 00
Amount available for fiscal year ending June 30, 1913	26, 949. 09
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 30, 000. 00

(See Appendix R 6.)

7. *Pascagoula, Leaf, and Chickasahay Rivers, Miss.*—(*a*) *Pascagoula River* (*above the mouth of Dog River*).—Pascagoula River is formed by the junction of the Leaf and Chickasahay Rivers in the southern part of the State of Mississippi, near the town of Merrill, and flows in a southerly direction, emptying into Mississippi Sound at Pascagoula. This improvement is limited to that part of the river above the mouth of Dog or Escatawpa River, and is 82.11 miles in length. Dog River flows into Pascagoula River 6.8 miles above the mouth of the latter. The width of this stream varies from 250 to 350 feet at mean low water.

Originally navigation of this part of Pascagoula River was impossible except during periods of high water. The minimum width of the channel was 60 feet and the minimum depth was 1 foot at mean low water, the stream being very much obstructed by logs and snags.

The first project for this improvement, which was adopted in 1880, in addition to providing for dredging work at the mouth, described in the preceding report on Pascagoula River, Miss., contemplated the improvement of the river above by the removal of snags and overhanging trees. Under this project the river was cleared of obstructions between 1882 and 1884, at a cost of $15,000, since which time funds have been applied to maintenance.

The river and harbor act of March 3, 1899, made a separate appropriation for the work of removing obstructions from Pascagoula River above the mouth of Dog River. Since that time this has been considered a separate improvement, and appropriations have been made accordingly.

Report of the examination upon which this project was originally based is printed in the Annual Report of the Chief of Engineers for 1879, page 835.

The preliminary examination and survey of Leaf and Pascagoula Rivers, called for by the river and harbor act of March 3, 1909, were made and reports thereon will be submitted to Congress at its next session.

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[1] Exclusive of amount available for fiscal year 1913.

For information as to reports on other examinations and surveys of the Pascagoula River, see report immediately preceding this one.

The existing project provides for maintenance of the channel above Dog River by the removal of obstructions from time to time.

The nonpropelling snagboat *Escatawpa*, which during the earlier part of the season worked on the Leaf River until funds were practically exhausted, commenced work on Pascagoula River at Merrill, Miss., November 15, 1911, and worked downstream about 10 miles, removing snags, logs, and overhanging trees until December 14, when funds were almost exhausted. A rise in the river stopped the work. During this time 1,193 obstructions were removed from the river, clearing 10 miles of the channel. Expenditures amounted to $1,993.60.

From the mouth of Dog River up to Dead Lake, 32 miles, a draft of 7 feet at mean low water can be carried; from this point up to the head of the river, 50 miles, a channel of about 3 feet depth and 60 feet width at mean low water has been obtained. This stream is affected by the tide as far up as Dead Lake. Freshets cause a variation of 25 feet in water level at Merrill, Miss.

The total amount expended on the improvement to June 30, 1912, was $53,470.24, of which $38,470.24 was applied to maintenance.

Commerce originating on Pascagoula River above the mouth of Dog River during the calendar year 1911 amounted to 301,538 short tons, principally logs, cross ties, charcoal, and general merchandise, valued at $1,488,500.

The project has effected a reduction in rail rates for carload shipments of lumber from Merrill, Miss., to the coast during the past year.

Available funds and future appropriations will be applied to removal of obstructions in preservation of the improvement.

July 1, 1911, balance unexpended	$2,273.36
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,993.60
July 1, 1912, balance unexpended	279.76
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

(*b*) *Leaf River.*—The source of this river is in the southeastern part of Mississippi. The stream is about 135 miles long. The head of the improvement is at the mouth of Bowie Creek, near Hattiesburg, Miss. The river flows in a southeasterly direction to its junction with the Chickasahay at Merrill, Miss., these two streams forming the Pascagoula River. The length of the section of river under improvement is 78.85 miles, and the width ranges from 180 to 230 feet at mean low water.

Originally it was impracticable to navigate this river on account of snags, logs, and overhanging trees. The minimum width was 100 feet and the minimum depth 2½ feet at mean low water.

The original project for this improvement was adopted in 1890, its purpose being to afford a channel for high-water navigation from

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[1] See consolidated money statement on p. 633.

Bowie Creek to the mouth of the river, a distance of 78.85 miles, by the removal of obstructions and overhanging trees. This project was completed in 1897 at a cost of $11,019.04, since which time expenditures have been in the direction of maintaining the improvement.

This project was based on an examination, the report of which is printed in Annual Report of the Chief of Engineers for 1889, page 1462.

No change has been made in the project as originally adopted, all work now being applied to maintenance of improvement.

The nonpropelling snag boat *Escatawpa* was at work on this improvement 7 miles below the mouth of Bowie Creek at the beginning of the past fiscal year, and continued working downstream for 21½ miles removing snags, logs, and overhanging trees until November 6, 1911, when, on account of near exhaustion of funds, she was transferred to Pascagoula River. Operations on Leaf River resulted in the removal of 2,418 obstructions, and expenditures during the fiscal year amounted to $4,417.09.

The total amount expended on this improvement up to June 30, 1912, was $34,202.20, of which $23,183.16 was applied to maintenance.

The maximum mean low water draft that could be carried over the improvement on June 30, 1912, was 2 feet, and the minimum width of the channel was 100 feet, but the river is much obstructed with logs, snags, and stumps. At the mouth of Bowie Creek the variation in the river surface during the past seven years has averaged 18 feet.

The commerce of Leaf River during the calendar year 1911 amounted to 167,120 short tons, principally logs and timber, valued at $691,000.

This project has no present effect on freight rates, but it is claimed that if continuous navigation were rendered practicable, the effect on railroad rates would be marked.

It is proposed to apply the funds estimated as a profitable expenditure during the fiscal year ending June 30, 1914, to removal of obstructions in maintenance of the improvement.

In addition to the funds available at the beginning of the past fiscal year for work on this improvement $3,000 was transferred from the Chickasahay River allotment to this work, which was considered much more urgent.

July 1, 1911, balance unexpended	$1,714.89
Amount transferred from allotment for Chickasahay River	3,000.00
	4,714.89
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	4,417.09
July 1, 1912, balance unexpended	297.80
July 1, 1912, outstanding liabilities	100.00
July 1, 1912, balance available	197,80
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(¹)

(*c*) *Chickasahay River.*—The source of this river is at Enterprise, Miss., about 205 miles above its mouth. The stream flows in a south-

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[1] See consolidated money statement on p. 633.

erly direction, following closely the eastern boundary of the State of Mississippi, and joins with the Leaf River to form the Pascagoula River at Merrill, Miss. The upper limit of the improvement is about 75 miles above its mouth, at Bucatunna, Miss. The width of the channel varies from 50 to 150 feet at mean low water.

The original condition of this river was such that it was navigable for small rafts only during high water, and even navigation of this character was troublesome and dangerous. The minimum width of the channel was 50 feet and the minimum depth 6 inches at mean low water, the river being badly obstructed by logs and snags.

The original project for the improvement was adopted by the river and harbor act of September 19, 1890, and provided for obtaining a high-water channel from the mouth of the river up to Shubuta, Miss., a distance of 130 miles, by the removal of obstructions from the channel and overhanging trees from the banks. The river and harbor act of June 3, 1896, modified this project by limiting the improvement to that part of the river between the mouth and Bucatunna, Miss., about 75 miles. The project further provided for the maintenance of the improved channel. The project, as modified, was completed in the latter part of 1896, at a cost of $12,399.73.

The project was based on an examination made in 1888, report of which is printed in Annual Report of the Chief of Engineers for 1889, page 1463.

The existing project was adopted in the river and harbor act of March 3, 1905, and provides for maintaining the channel in Chickasahay River from the mouth to Bucatunna, Miss., by the removal of logs, snags, and other obstructions from the waterway, in order to keep the river in navigable condition for rafting at high-water stages, at an annual cost of $2,500. This project is based on an examination, report of which is printed in House Document No. 230, Fifty-eighth Congress, second session. This document does not contain a map. Also printed in Annual Report of the Chief of Engineers for 1904, page 1855.

Report of an examination, dated February 6, 1879, is printed in the Annual Report of the Chief of Engineers for 1879, page 841.

No work was done here during the past fiscal year. Expenditures, amounting to $250, were applied to care and preservation of public property and office expenses.

The total amount expended on the improvement to June 30, 1912, was $25,174.21, of which $12,774.48 was applied to maintenance of improvement.

A high-water channel has been provided by this improvement and is used almost exclusively by logs and rafts. It is navigable for such on a rise of 4 to 6 feet above mean low water. The variation of the water surface is as much as 25 feet at the mouth of the river.

Commerce on this river in the calendar year 1911 amounted to 71,015 short tons of logs and timber, with a small amount of general merchandise, valued at $318,750.

Of the funds available at the beginning of the past fiscal year, $3,000 was transferred to the Leaf River.

The project has no effect on freight rates.

July 1, 1911, balance unexpended	$3,325.79
Amount transferred to allotment for Leaf River	3,000.00
	325.79
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	250.00
July 1, 1912, balance unexpended	75.79

CONSOLIDATED.

July 1, 1911, balance unexpended	7,314.04
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	6,660 69
July 1, 1912, balance unexpended	653.35
July 1, 1912, outstanding liabilities	100.00
July 1, 1912, balance available	553.35
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]14,000.00

(See Appendix R 7.)

8. *Horn Island Pass, Miss.*—The channel through the bar had before improvement a depth which increased through natural causes from 14 or 15 feet in 1853 to about 18 feet in 1886, and has been available at low water since the latter date for vessels up to a draft of slightly less than 18 feet at mean low water.

Under the appropriations for improving Pascagoula River, Miss., carried by the river and harbor acts of August 18, 1894, and June 3, 1896, provision was made for the removal of the bar in Horn Island Pass, and in conformity with this provision a channel with a least depth of 20.5 feet (19.5 feet referred to the existing datum), and with a width of 200 feet, was dredged through the Horn Island Bar. The total cost of this work was $7,682.40, but the benefit of the improvement was soon lost through shoaling.

Under the appropriations for Pascagoula River and Horn Island Harbor carried by the river and harbor act of March 3, 1899, and the sundry civil act of June 6, 1900, an amount estimated at $88,000 was applied to dredging a 20-foot (19 feet present datum) channel at certain shoal areas in the Horn Island anchorage basin, the work being in progress between 1899 and 1901.

The existing project for the improvement of Horn Island Pass provides for the formation of a channel 21 feet deep at low water, 300 feet wide through the outer bar, and 200 feet wide elsewhere in the pass, at an estimated cost of $40,480, and $9,000 annually to preserve the improvement. The project was adopted by the river and harbor act of March 3, 1905, which carried an appropriation of $40,480 for the work. The project was completed by the U. S. dredge *Charleston* in 1907. Work since that date has been for maintenance only.

This project is based on an examination and survey, report of which is printed in House Document No. 506, Fifty-eighth Congress, second session. It contains no map. This report is also printed in Annual Report of the Chief of Engineers for 1904, page 1863.

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[1] Exclusive of the balance unexpended July 1, 1912.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Horn Island Pass	House	104	Fifty-third	Third	1905	1714
Horn Island Pass and passage to anchorage inside Horn Island.[1]	do	200	Fifty-fourth	Second	1897	1716
Horn Island Pass	do	314	Sixty-first	do		

There has been no change in the existing project since its adoption.

No work was done on Horn Island Pass during the past fiscal year. Expenditures amounted to $646.70 and were applied to payment of part of the cost of transferring the U. S. dredge *Charleston* from the Charleston, S. C., district to the Mobile district, as this dredge will be used during the approaching season on the Horn Island Pass work.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $64,079.56, of which $23,599.56 was applied to maintenance.

The maximum mean low-water draft that can be carried over the shoalest part of the locailty on June 30, 1912, is 21 feet. The average range of tide is about 1.1 feet.

Commerce using the channel through Horn Island Pass during the calendar year 1911 amounted to about 266,654 short tons of lumber, timber, crossties, and piling, valued at $1,906,540.

This improvement in conjunction with that of Pascagoula River, from which it is distant about 9 miles, results in effecting a reduction in rail freight rates between Pascagoula, Miss., and seaboard cities of the Atlantic coast, and in affording direct water freight rates on lumber from Moss Point and Pascagoula to foreign ports.

Available funds and future appropriations will be applied to maintenance of the channel through Horn Island Pass.

July 1, 1911, balance unexpended	$6,547.14
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	646.70
July 1, 1912, balance unexpended	5,900.44
July 1, 1912, outstanding liabilities	150.00
July 1, 1912, balance available	5,750.44
Amount appropriated by river and harbor act approved July 25, 1912	2,000.00
Amount available for fiscal year ending June 30, 1913	7,750.44
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2] 5,000.00

(See Appendix R 8.)

9. *Harbor at Biloxi, Miss.*—Originally the channel leading to Biloxi was about a quarter mile wide and had an available depth of 4 feet at mean low tide.

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[1] Contains map. Others contain no map.

[2] Exclusive of amount available for fiscal year 1913.

The harbor at Biloxi has an average width of about 500 feet, with a length of 6,000 feet, and depths ranging from 8 feet to 13½ feet. It is about 14 miles east of Gulfport, Miss., and 32 miles west of Pascagoula, Miss.

The original project for its improvement was adopted in 1882 and contemplated the formation of a channel through Deer Island Flats to connect Biloxi Bay with the Back Bay of Biloxi, at an estimated cost of $35,000. The channel thus proposed was to have a depth of 8 feet at mean low water, with a width sufficient for navigation.

This project was modified by the river and harbor act of July 5, 1884, so as to provide for a channel 8 feet deep and 150 feet wide from Mississippi Sound to the wharves at Biloxi, at an estimated original cost of $55,000. This project was completed from 1887 to 1893, at a cost of $44,382.27.

This project was based on an examination of Biloxi Harbor, Miss., the report on which is dated February 16, 1882, and printed in the Annual Report of the Chief of Engineers for 1882, page 1322; also printed in Senate Document No. 131, Forty-seventh Congress, first session.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Back Bay of Biloxi, Miss	House	71	Forty-eighth	Second	1885	1373
Do	(1)				1898	1781
Channel from Ship Island Harbor to Biloxi, Miss.[2]	House	190	Fifty-fifth	Third	1899	1787
Do.[3]	do	198	Fifty-eighth	Second	1904	1847
Biloxi Harbor channel and channel around eastern end of peninsula into Back Bay.[2]	do	1088	Sixtieth	do		

[1] Not known. [2] Contains map. [3] Contains no map.

There has been no change in the project for this improvement as finally adopted in 1884. Since 1893 funds have been appropriated for and applied to maintenance of a channel 8 feet deep and 150 feet wide from Mississippi Sound to the wharves at Biloxi.

No work was done on this improvement during the past fiscal year. The expenditure of $260.74 made was applied to upkeep of plant last used in maintenance dredging at this locality.

The total amount expended on the existing project up to the close of the fiscal year was $76,069.67, of which $31,687.40 was applied to maintenance.

The maximum draft that can be carried over the shoalest part of this locality on June 30, 1912, is 6½ feet at mean low tide. The average range of tide is about 1½ feet. The channel is about 1¼ miles long, extending from the 8-foot contour in Mississippi Sound to the 8-foot curve of depth in Biloxi Harbor.

Commerce using this improvement during the calendar year 1911 amounted to 84,167 short tons of fish and oysters, lumber and timber, and naval stores and brick, valued at $795,100.

This project apparently has little or no effect on freight rates.

It is proposed to apply the funds estimated as a profitable expenditure in fiscal year ending June 30, 1914, to work of dredging in maintenance of the improvement.

July 1, 1911, balance unexpended	$1,573.34
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	260.74
July 1, 1912, balance unexpended	1,312.60
Amount appropriated by river and harbor act approved July 25, 1912	4,000.00
Amount available for fiscal year ending June 30, 1913	5,312.60
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

(See Appendix R 9.)

10. Harbor at Gulfport and Ship Island Pass, Miss.—Originally no channel existed between Ship Island Harbor and Gulfport, Miss. The depths on the site of the channel ranged from 19 to 8½ feet, and over the site of the anchorage basin they varied from 8½ to 2½ feet, at mean low water.

The harbor here is 1,320 feet by 2,640 feet, and it has a depth of about 22 feet at mean low tide. It is about 44 miles from Pascagoula Harbor on the east and about 78 miles from New Orleans (via Lake Borgne Canal) on the west.

The existing project was adopted by the river and harbor act of March 3, 1899, which authorized the Secretary of War to enter into contract for dredging a channel 300 feet wide and 19 feet deep at mean low water from the anchorage basin at Ship Island Harbor, on the Gulf of Mexico, to Gulfport, Miss., and to construct at the end of this channel next to the shore an anchorage basin of similar depth and not less than 2,640 feet by 1,320 feet in area. This act also authorized the Secretary of War to contract for the maintenance of this channel and anchorage basin for a term of five years after their completion for the sum of $10,000 annually.

This project was modified by the river and harbor act of June 25, 1910, by authorization of additional depth in basin and channel not to exceed 23 feet; it was further modified by the river and harbor act of February 27, 1911, which made an appropriation of $100,000, and provided that of this amount $60,000, or so much thereof as may be necessary, may be expended in the repair and modification of the U. S. dredge *Barnard*, which was formally assigned to Gulfport Harbor and Channel, in accordance with recommendations contained in Rivers and Harbors Committee Document No. 2, Sixtieth Congress, first session, which contemplates obtaining and maintaining such depths in the anchorage basin, and such depths and widths in the channel from the basin to Ship Island Harbor as may be practicable by the operation of a Government dredge; and still further modified by the river and harbor act of July 25, 1912, which authorized the purchase or construction of a new dredging plant and the retransfer of the dredge *Barnard* to the Southwest Pass improvement.

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[1] Exclusive of amount available for fiscal year 1913.

Contract was entered into in 1901 for dredging the channel and anchorage basin, the work to be completed within two years from April 21, 1901, for $150,000, and for the maintenance of the channel and basin for a term of five years after completion for the sum of $10,000 per annum. Work was commenced on April 16, 1901. By joint resolution of Congress, approved June 14, 1906, it was provided that the channel and basin should be accepted as dredged, and that $150,000 should be paid the contractor for the work, the channel and basin having been dredged to the approximate depth and width required in the contract. The payment was made. The period of maintenance commenced June 14, 1906.

The river and harbor act approved March 2, 1907, appropriated $100,000 for continuing the improvement and maintenance of the anchorage basin at Gulfport and channel therefrom to the anchorage or roadstead at Ship Island, also Ship Island Pass between Ship and Cat Islands, Miss., and authorized the Secretary of War to annul that portion of the contract entered into February 20, 1901, with Spencer S. Bullis, relating to the maintenance of a channel and anchorage basin between Ship Island and Gulfport. The annulment of this contract was effected by a supplemental agreement approved by the Secretary of War June 11, 1907.

The report of the survey upon which the improvement of Gulfport Harbor and Ship Island Pass., Miss., was originally based is printed in the Annual Report of the Chief of Engineers for 1899, page 1787. Reports of another examination and survey of this locality are printed in House Document No. 184, Fifty-ninth Congress, second session, and in Document No. 2, Committee on Rivers and Harbors, House of Representatives, Sixtieth Congress, first session.

Prior to the act of March 2, 1907, appropriations were made separately for Gulfport Harbor, Miss., and Ship Island Pass, Miss.

To the work of maintenance of Gulfport Harbor and channel and to extension of depths in same, the sum of $370,073.33 has been applied.

Under an appropriation of $40,000, carried by the river and harbor act of March 3, 1899, the channel through Ship Island Pass was dredged from its original depth of 21 feet to the project depth of 26 feet at mean low water and 300 feet width. These depths were 20 feet and 25 feet, respectively, referred to present datum. Of the above appropriation $39,695.88 was applied to this work and the balance turned back into the Treasury.

To the work of restoration and maintenance of the Ship Island Pass channel, $18,079.64 has been applied.

The project for Gulfport Harbor, as at present approved, contemplates maintenance of the anchorage basin at Gulfport, 1,320 feet by 2,640 feet, and channel therefrom to Ship Island anchorage, 13¼ miles, with such depths and widths as may be practicable by the operation of a Government dredge.

The present project for Ship Island Pass provides for restoration of the channel there across the bar 300 feet wide and 26 feet deep at mean low water.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Ship Island Pass, Miss.	Senate	11	Forty-seventh	First	1882	1321
Ship Island Pass and channel to Gulfport, Miss.	House	84	Fifty-fourth	Second	1897	1709
From Ship Island Harbor to mainland on coast of Mississippi.[1]	do	252	do	do	1897	1723
Anchorage basin at Gulfport to anchorage at Ship Island and Ship Island Pass, Miss.	do	184	Fifty-ninth	do		

[1] Contains map. Others contain no maps.

The U. S. dredge *Pascagoula* was engaged on the Gulfport Channel from July 2 to September 15, 1911, removing 1,560,985 cubic yards of material, place measurement, at a field cost of $24,141.80, or 1.55 cents per cubic yard, and a gross cost, including surveys, office expenses, etc., of $31,054.85, or 1.99 cents per cubic yard. These funds were applied to maintenance work and extension of depth, and the portion of channel worked over was that from 1,000 feet south of the pier to 1,612 feet south of Beacon 4, a distance of 32,484 feet, leaving an average depth of 22½ feet at mean low water.

In addition to the above, $926.48 was applied to repair of the bulkhead built by the United States at Gulfport; $1,411.03 was expended on repair and upkeep of the pipe line of the dredge *Barnard*, and $76.89 for the repair and operation of the automatic tide gauge maintained at Gulfport. The sum of $1,137.82 was expended from the allotment for work at Ship Island Pass, Miss., and was applied to payment of part of the cost of transferring the U. S. dredge *Charleston* from Charleston (S. C.) district to the Mobile district, as it is intended to use this dredge on the Ship Island Pass work after completing its work on Mobile Bar.

Since the last dredging was done here a large amount of shoaling has taken place, especially near the inner end of the channel, where there is a depth of only 16 feet. The material, however, is very soft and a draft of 18 feet at mean low water can be carried. Very little shoaling occurs in the basin since the construction of the bulkhead at its entrance, and there is now an average depth of 21 feet at mean low water except in the northwest corner, which has not been dredged for several years.

The average range of tide for Gulfport Harbor and Ship Island Pass is about 1½ feet.

The maximum draft that can be carried over the shoalest part of the improvement at Ship Island Pass is 23 feet at mean low water.

The total amount expended on the entire improvement to June 30, 1912, was $614,048.70, of which $388,152.97 was applied to maintenance. Of the amount expended, $556,273.18 was applied to Gulfport Harbor and $57,775.52 to work at Ship Island Pass. Amount received from sales, $179.35.

The commerce of Gulfport Harbor and Ship Island Pass during the calendar year 1911 amounted to 1,027,302 short tons, principally lumber, timber, cotton, and naval stores, valued at $14,456,065.

The project results in affording a reduction in rail freight rates between Gulfport and seaboard cities of the Atlantic coast and in affording water freight rates from Gulfport to foreign ports.

With available funds and those estimated as a profitable expenditure for the fiscal year ending June 30, 1914, it is proposed to construct a dredge and attendant plant for this harbor and to maintain the improvement and obtain such additional depths as may be possible.

GULFPORT HARBOR.

July 1, 1911, balance unexpended		$94,799.33
June 30, 1912, received from sales		25.85
		94,825.18
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$20,000.00	
For maintenance of improvement	13,469.25	
		33,469.25
July 1, 1912, balance unexpended		61,355.93
July 1, 1912, outstanding liabilities		726.72
July 1, 1912, balance available		60,629.21
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		190,000.00
Amount available for fiscal year ending June 30, 1913		250,629.21
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance of improvement		[1]

SHIP ISLAND PASS.

July 1, 1911, balance unexpended	13,058.18
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,137.82
July 1, 1912, balance unexpended	11,920.36
July 1, 1912, outstanding liabilities	120.36
July 1, 1912, balance available	11,800.00
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	10,000.00
Amount available for fiscal year ending June 30, 1913	21,800.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]

CONSOLIDATED.

July 1, 1911, balance unexpended		107,857.51
June 30, 1912, received from sales		25.85
		107,883.36
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$20,000.00	
For maintenance of improvement	14,607.07	
		34,607.07

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[1] See consolidated money statement on this page.

July 1, 1912, balance unexpended	$73,276.29
July 1, 1912, outstanding liabilities	847.08
July 1, 1912, balance available	72,429.21
Amount appropriated by river and harbor act approved July 25, 1912	200,000.00
Amount available for fiscal year ending June 30, 1913	272,429.21
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 87,000.00

(See Appendix R 10.)

11. Wolf and Jordan Rivers, Miss.—Originally the least depth on the bar at the mouth of Wolf River was something under 3 feet, and on the bar at the mouth of the Jordan River it was not quite 4 feet at mean low water.

The channel at the mouth of Jordan River extends from the 7-foot contour in the mouth of the river through the bar to the 6-foot contour in Bay St. Louis, 1¾ miles; has a width of 100 feet at bottom and a depth of 7 feet at mean low water; and the channel at the mouth of Wolf River has similar dimensions, except that the length is 1½ miles. The Jordan River above the mouth has a width of about 250 feet, and is navigable for vessels drawing 7 feet for a distance of 16 miles; the Wolf River above the mouth is about 225 feet wide and is navigable for 7-foot draft for about 20 miles. This improvement is about 24 miles west from Gulfport, Miss.

The present and only project was adopted by the river and harbor act of March 2, 1907, and provides for the formation of a channel 7 feet deep and 100 feet wide at bottom, with side slopes of 1 on 6, across the bar at the mouth of each of the streams named, from the 7-foot curve of depth in the river to the 6-foot contour in Bay St. Louis, at a cost of $30,000 for completing the work and $5,000 per annum thereafter for maintenance. After reaching the 6-foot contour in the bay the material becomes so soft that a draft of 7 feet can easily be carried through it.

This project was completed at a cost of $29,195.19. Expenditures since have been for maintenance.

The report of the examination and survey upon which the project is based is printed in House Document No. 917, Fifty-ninth Congress, first session, and it contains a map.

Reports of previous examinations are printed in the Annual Report of the Chief of Engineers for 1893, pages 1787 and 1789.

No modification has been made in the existing project since its adoption.

No work was done on this improvement during the past fiscal year, as there were no funds available for the purpose.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $35,000, of which $5,804.81 was applied to maintenance.

The maximum draft that can be carried over the shoalest part of the channel at the mouth of Jordan River is 7 feet, and at the mouth of Wolf River is 7 feet.

The average range of tide at this locality is 1¾ feet.

Commerce on these two streams during the calendar year 1911 amounted to 50,742 short tons of lumber, rosin, turpentine, and general merchandise, valued at $1,049,300.

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[1] Exclusive of amount available for fiscal year 1913.

The improvement has been of immediate and considerable local benefit, but is believed to have had little, if any, effect on freight rates.

It is proposed to apply the funds estimated below as a profitable expenditure during the fiscal year ending June 30, 1914, to work of dredging with Government dredge in maintenance of the improvement.

Amount appropriated by river and harbor act approved July 25, 1912	$5,000.00
Amount available for fiscal year ending June 30, 1913	5,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

(See Appendix R 11.)

12. East Pearl River, Miss.—Originally there was a depth of about 7 feet through this channel at mean low water. The width was about 1,000 feet of this depth.

The dredged channel at the mouth of East Pearl River is 6,332 feet long by 200 feet wide, with a depth of 8 feet at mean low tide. The river inside the mouth has a width of about 400 feet, and is navigable for a draft of 9 feet to Logtown, Miss., a distance of 14 miles. This improvement is about 35 miles to the westward from Gulfport, Miss.

The original project, adopted August 5, 1886, provided for a channel 100 feet wide and 12 feet deep at mean low water, and in 1888 and 1890 appropriations of $5,000 each were made for the work. Proposals were advertised for, but those received were rejected as too high. Under the provisions of the river and harbor act of June 3, 1896, a survey was made with a view to obtaining a channel 17 feet deep at mean low water, and the report thereon is printed in Annual Report of the Chief of Engineers for 1897, page 1727, and in House Document No. 206, Fifty-fourth Congress, second session. This document contains a map. A channel 300 feet wide and 9 feet deep at mean low water was all that could be recommended, at an estimated cost of $18,199.80. This project was adopted by the river and harbor act of March 3, 1899, and an appropriation of $18,199.80 made for the work. With these funds and the two former appropriations of $5,000 a channel of the projected dimensions was finally dredged at a total cost of $27,853.92, the work being completed February 5, 1900. The balance of $345.88 was then turned back into the Treasury.

The existing project was adopted by the river and harbor act of June 25, 1910, and is based upon a survey printed in House Document No. 328, Sixtieth Congress, first session. This document contains no map. It provides for the restoration of the channel at the mouth of East Pearl River, which had almost disappeared since the last work, in 1900, to its former depth of 9 feet at mean low water for a width of 200 feet, at an estimated cost of $34,000 and $6,000 annually for its maintenance.

No modification has been made in this project.

During December, 1910, and January, 1911, the channel at this locality was dredged out to a depth of 9 feet at mean low water, for a width of 200 feet from the 9-foot contour in the mouth of East Pearl River to the 9-foot curve in Lake Borgne, about 1¼ miles.

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[1] Exclusive of amount available for fiscal year 1913.

No work was done here during the past fiscal year. The sum of $1,868.40 was expended in part payment for repair and upkeep of the U. S. dredge *Pascagoula* and attendant plant.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $36,782.05, of which $8,928.13 was applied to restoration or maintenance under the existing project.

A maximum draft of 8 feet at mean low water can be carried over the shoalest part of the channel under improvement on June 30, 1912, and the range of tide is about 1½ feet.

The commerce using the channel at the mouth of East Pearl River during the calendar year 1911 amounted to 121,856 short tons of logs and timber, hay and grain, naval stores, and general merchandise, valued at $1,214,112.

The project has but little if any effect on freight rates but is of considerable local benefit.

July 1, 1911, balance unexpended	$12,940.27
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,868.40
July 1, 1912, balance unexpended	11,071.87

(See Appendix R 12.)

13. Pearl River below Rockport, Miss.—The source of Pearl River is in the north central part of the State of Mississippi. It flows in a southwesterly and then in a southerly direction for a distance of about 485 miles, emptying into the Rigolets, in eastern Louisiana. The section under improvement runs from Rockport, Miss., to the mouth, 246 miles. The lower part is divided into two principal streams, known as East Pearl River and West Pearl River. The former empties into Mississippi Sound near Dunbar, La., and the latter into the Rigolets, which connect Lake Borgne and Lake Pontchartrain, and is the section included in the improvement.

The limits of this improvement originally extended from the mouth of the river to Jackson, a distance of 313 miles. By act of Congress of April 21, 1900, the construction of a fixed highway bridge across Pearl River at Rockport was legalized. This point thereby became the head of navigation on the lower river for boats of any considerable size and the upper limit of the project. However, the bridge at Rockport was washed away in February, 1906. The distance from Jackson to Rockport is 67 miles.

Prior to improvement the condition of the river was such that it was not navigable except during high-water stages, and even then navigation was difficult and dangerous.

The original project for this improvement was adopted in 1880, and provided for a channel of navigable width and 5 feet deep at low water, by the removal of snags and sunken trees from the river bed and overhanging trees from the banks, at an estimated cost of $95,940. This project having been found to be impracticable, it was modified in 1885, so as to provide for a 2-foot channel at low water throughout this section of the river, at an estimated cost of $145,940.

With past appropriations the river has been improved until it became navigable for light-draft boats on a slight rise up as far as Monticello, about 211 miles above the mouth. Above Monticello the river has never been navigable except on a rise of 7 feet or more.

Appropriations between 1899 and 1907 were applied to the maintenance of the lower 100 miles of river.

In 1906 it was found necessary to revise the estimate for improving this section of Pearl River, it being then decided that it would cost $100,000 to complete the project (see H. Doc. No. 183, 59th Cong., 2d sess.), and appropriations, beginning with that of March 2, 1907, have been made on this basis.

Report of the survey upon which the project was originally based is printed in the Annual Report of the Chief of Engineers for 1879, page 879.

Report of an examination of Pearl River from its mouth to Rockport, Miss., is printed in House Document No. 183, Fifty-ninth Congress, second session. It contains no map.

Report dated November 6, 1909, of an examination of Pearl River from Rockport to Jackson, Miss., is printed in House Document No. 468, Sixty-first Congress, second session.

The existing project provides for a 2-foot channel at mean low water from Rockport, Miss., to the mouth, 246 miles, by the removal of snags and overhanging trees.

At the beginning of the fiscal year the snag boats *Pearl* and *Black Warrior* were at work on the river, continuing until December 19, 1911, when operations were suspended on account of high water. The channel was worked over from the mouth of river upstream, going over 116½ miles of river previously worked, and completing 28½ miles of original work under the project. Expenditures amounted to $14,603.32, of which about $10,000 was applied to maintenance work and the balance to original work.

The total amount expended on this improvement to June 30, 1912, was $244,343.86, of which $99,900.55 was applied to maintenance.

A maximum mean low water channel, 3 feet deep and 50 feet wide, now exists from the mouth of the river up 145 miles, and above this point to Columbia, a farther distance of 10 miles, a maximum mean low water draft of 1½ feet can be carried; from here up to Monticello, 56 miles, the river can be navigated by light-draft boats on a slight rise above mean low water. Above Monticello the river has never been available except on a rise of 7 feet or more. The river at Columbia rises to a height of 21 feet above mean low water. Work under the existing project is about 43 per cent completed.

Commerce on this section of Pearl River during the calendar year 1911 amounted to 40,825 short tons of logs and timber, valued at $409,975.

The result of the work done has been to render Pearl River navigable for light-draft boats up as far as Columbia; and though the channel has been but little used, it is reported that very material cuts in freight rates on railroads have resulted.

Available funds and future appropriations will be applied to a continuation of work under the project, at the same time maintaining that part of the channel upon which original work has already been completed.

The snag boat *Black Warrior* having been found unsuited to snagging work in this district, her disposition by sale or transfer has been recommended, and in the item of $22,000 estimated as required for work of improvement during the fiscal year ending June 30, 1914, is included $12,000 which it is proposed to apply to the construction and equipment of a snagboat suited to the work on Pearl River below Rockport.

July 1, 1911, balance unexpended		$18,670.85
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$4,603.32	
For maintenance of improvement	10,000.00	
		14,603.32
July 1, 1912, balance unexpended		4,067.53
July 1, 1912, outstanding liabilities		517.06
July 1, 1912, balance available		3,550.47
Amount appropriated by river and harbor act approved July 25, 1912		15,000.00
Amount available for fiscal year ending June 30, 1913		18,550.47
Amount (estimated) required to be appropriated for completion of existing project		[1] 54,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 87,000.00

(See Appendix R 13.)

14. Removing sunken vessels or craft obstructing or endangering navigation.—On March 26, 1912, an allotment of $1,000 was made from the indefinite wreck appropriation for the purpose of removing wrecks of the sunken vessels *P. J. Lyons*, *M. Flechas*, and *J. A. Sprinkler* from Bayou La Batre, Ala.

The wrecks were entirely removed with United States plant and hired labor, at a cost of $531.69, and the balance of funds turned back into the Treasury.

(See Appendix R 14.)

EXAMINATION AND SURVEY REQUIRED BY RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports dated September 30, 1910, and December 27, 1911, on preliminary examination and survey, respectively, of *mouth of Pascagoula River, Miss., with a view to securing increased depth in a continuous channel from the upper limits of the present project in Dog River to deep water in the Gulf of Mexico*, required by the river and harbor act approved June 25, 1910, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 682, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $383,030 for first construction, and $50,000 annually for maintenance, subject to certain specified conditions, is presented.

The local officer was also charged with the duty of making a preliminary examination and survey of *Leaf and Pascagoula Rivers, Miss., from the mouth of Bowie Creek to the junction of Pascagoula and Dog Rivers*, provided for in the river and harbor act of March 3, 1909, and reports thereon will be duly submitted when received.

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[1] Exclusive of amount available for fiscal year 1913.

IMPROVEMENT OF RIVERS AND HARBORS IN THE NEW ORLEANS, LA., DISTRICT.

This district was in the temporary charge of Maj. H. Burgess, Corps of Engineers, from July 1, 1911, to September 30, 1911, and in the charge of Lieut. Col. Lansing H. Beach, Corps of Engineers, division engineer of the Gulf Division, from that date, having under their immediate orders Capt. Robert P. Howell, jr., Corps of Engineers.

1. Southwest Pass, Mississippi River.—Southwest Pass is one of the principal outlets of the Mississippi River. It flows in a generally southwest direction and its length from the Head of the Passes to the Gulf of Mexico is about 15 miles. It was obstructed by a bar at its mouth, having a depth of only 9 feet over it, while the remainder of the pass had depths ranging from 26 to 83 feet at low water (mean low Gulf level). The width of the pass varies between 1,200 and 2,400 feet.

Prior to the opening of South Pass to deep-draft vessels Southwest Pass was the entrance to the river generally used by vessels bound to and from the port of New Orleans.

A history of the attempted improvements of the mouth of the Mississippi River from 1837 to 1898 is given in the Annual Report of the Chief of Engineers for 1899, page 1914.

The existing project for improvement is based on reports submitted in 1899 and 1900 (Reports of the Chief of Engineers for 1899, p. 1863, and for 1900, p. 2287), was adopted by the act of June 13, 1902, and contemplates securing a channel 35 feet deep at mean low water and 1,000 feet wide throughout Southwest Pass by dredging; the construction of two jetties to maintain the channel; the construction of sills across Cubits Gap, the Jump, and Baptiste Collets Canal; the closing of all minor outlets below the forts; the construction of a dredge in addition to the one provided for by the acts of March 3, 1899, and of June 6, 1900, under appropriation for improving outlets of the Mississippi River; the necessary plant, such as tugboats, barges, tracks, buildings, etc.; and the purchase of land at the shore ends of the jetties, at an estimated cost of $6,000,000 and $150,000 per annum for maintenance. The act of 1902 adopting the project, authorized the Secretary of War, in his discretion, to modify the plans described in the report submitted in 1900. The act of May 28, 1908, included in the improvement the dredging of shoals in the river between Cubits Gap and the Head of the Passes, where necessary to secure a depth of 35 feet with practical width. Additional dredging plant was authorized by the act of March 3, 1909.

Under the existing project all of the land below or south of Pilottown on the east bank and all that below the United States reservation on the west bank of Southwest Pass, containing about 1,275 acres, was acquired on July 10, 1903, for use in connection with the work, at a cost of $5,000.

Construction of the jetties was commenced in December, 1903, and completed in January, 1908, at a cost of about $2,627,000. Extension of the east jetty for a length of 3,000 feet and of the west jetty for a length of 3,750 feet was commenced in April, 1911, and work is still in progress. These extensions are part of the original project of improvement.

Under authority for construction of dredges, the *Barnard* was constructed in 1904, at a cost of $240,000; the *Benyaurd* in 1904, at a cost of about $415,000; and the *New Orleans* in 1912, at a cost of about $520,000. By act of February 27, 1911, the *Barnard* was transferred to the Mobile (Ala.) engineer district, and by act of July 25, 1912, retransferred to the Southwest Pass improvement.

Dredging operations began in April, 1905, and until June 30, 1912, about 11,633,000 cubic yards of material had been removed by Government dredges; the *St. Johns*, *Sumter*, and *Atlantic*, borrowed from other engineer districts, being also used at various times. In 1907 and 1908 some 3,575,000 cubic yards of material was removed under contract.

Sills were placed across Cubits Gap and the Jump and additional mattresses placed on the sill at the head of Pass à Loutre in 1907 and 1908. Ten outlet bayous from Southwest Pass were closed with sheet-pile dams, the Eads mattress at the Head of the Pass was removed, and 10 spur dikes along the jetties were constructed between 1908 and 1911.

In 1908 and 1909 coaling plant, wharf, and foundations for buildings and walks, steel-frame building, ice machine, refrigerating and distilling plant, office building, and 16 dwellings were constructed, boiler installed in machine shop, and machines, tools, etc., purchased, at a total cost of $116,388.40.

Operations during the fiscal year consisted in dredging by the U. S. dredges *Benyaurd*, *Atlantic*, and *New Orleans*, the latter, however, operating but 47 days. The amount of material removed was 3,314,770 cubic yards.

Under contract, approved April 13, 1911, Messrs. Christie & Lowe, contractors, placed 183,555⅝ square yards of mattress and 69,016 tons of stone in building the extension to the jetties.

The outlet known as Double Bayou, 8.2 miles below the Head of the Passes lighthouse, was closed by a sheet-piling dam 189 feet long.

Two spur dikes were extended 130 feet and 150 feet, respectively, and maintenance work done in connection with others and the jetties.

Many minor but important items of repair were made by the shore plant, necessary surveys made, and work pertaining to general care and preservation of plant and premises done.

The available depth is 31 feet at mean low tide.

The channel was opened to navigation December 26, 1911.

The sum of $744,337.90 was expended during the fiscal year.

To June 30, 1912, there has been expended on the existing project the sum of $6,364,614.78.

There has been received from miscellaneous sources, such as sales, etc., the sum of $4,966.72.

The amount required for expenditure during the fiscal year ending June 30, 1914, is intended for continuing improvement and for maintenance.

As stated in the Annual Report of the Chief of Engineers for 1911, "The work is proving somewhat more expensive than was originally contemplated by the board whose estimates were accepted, but any estimate dealing with a work of such character and magnitude must necessarily be more or less uncertain." For this reason the original estimate was more or less uncertain, and any estimate now made ought not to be regarded as absolutely definite.

July 1, 1911, balance unexpended	$1,305,366.51
Miscellaneous receipts deposited to the credit of the appropriation during the fiscal year	18.00
	1,305,384.51
June 30, 1912, amount expended during fiscal year, for works of improvement	[1] 744,337.90
July 1, 1912, balance unexpended	561,046.61
July 1, 1912, outstanding liabilities	126,754.53
July 1, 1912, balance available	434,292.08
Amount appropriated by river and harbor act approved July 25, 1912	450,000.00
Amount available for fiscal year ending June 30, 1913	884,292.08
July 1, 1912, amount covered by uncompleted contracts	223,577.76
Amount (estimated) required to be appropriated for completion of existing project	[2] 500,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[2] 500,000.00

(See Appendix S 1.)

2. *Maintenance of South Pass Channel, Mississippi River.*—South Pass is an outlet of the Mississippi River and flows in a generally southern direction. Its length—from the Head of the Passes to the Gulf of Mexico—is about 13 miles. Prior to improvement it was obstructed by a bar at its mouth and head over which depths of 9 and 13 feet, respectively, existed at low water (mean low Gulf level), while through the balance of the Pass there were depths of more than 30 feet, except at two intermediate localities, where the depths were 27 and 28 feet. The width of the Pass varies between 530 and 850 feet.

The act of March 3, 1875, as amended by the acts of June 19, 1878, and March 3, 1879, made provision for the construction by James B. Eads, or his representatives, of jetties and other works in South Pass to secure and maintain a channel 26 feet in depth through the pass and through the jetties at the mouth of the pass a channel "twenty-six feet in depth, not less than two hundred feet in width at the bottom, and having through it a central depth of thirty feet without regard to width."

A contract was made for the maintenance of such channel for a period of 20 years, and this contract expired January 28, 1901, payments made under the contract aggregating $8,000,000.

The existing project is for maintenance, and was authorized by the emergency act of June 6, 1900, which provides that at the termination of the contract with the representatives of the estate of James B. Eads, deceased, the Secretary of War shall take charge of and maintain the channel, jetties, and auxiliary works at South Pass, for which a sum not to exceed $100,000 per year is appropriated until otherwise provided by law.

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[1] The amount expended for works of improvement is as follows:

As per vouchers	$741,388.13
Treasury settlements	2,949.77

The above amount does not include the sum of 35 cents which was deposited on account of overpayment.

[2] Exclusive of amount available for fiscal year 1913.

The sundry civil act of June 6, 1900, authorized the removal of unusual obstructions during the fiscal year 1901 by use of the dredging plant of the Mississippi River Commission and appropriated $25,000 for altering such dredges for use in South Pass.

The act of June 13, 1902, authorized the use of any available Government dredge to maintain the pass with the utmost efficiency, and also authorized the purchase of land bordering the pass from the heirs and representatives of James B. Eads, deceased.

The act of May 28, 1908, included in the project the dredging of shoals in the river between Cubits Gap and the Head of Passes when necessary to secure a depth of 35 feet and a practical width, by authorizing the use of funds from this appropriation.

Under the project work of maintenance began January 29, 1901, and since that date dredging in the pass and at the jetties has been carried on as it became necessary with United States plant; the jetties and auxiliary works have been kept in repair and some additions made to the permanent plant.

Examinations and surveys of the pass were carried on from January 29, 1901, to June 30, 1902, as part of this work.

The lands bordering the pass from Head of Passes to the Gulf, comprising about 6,994 acres, together with the buildings thereon, were purchased July 8, 1903, for $35,000.

Operations during the fiscal year have consisted in the maintenance of jetties and auxiliary works, repairs to the mattress sill across the head of Pass à Loutre, and 14 days' dredging in the outer channel.

The sum of $79,709.99 was expended during the year.

To June 30, 1912, the sum of $1,338,560.01 had been expended on the work of the existing project.

There has been received from miscellaneous sources, sales, etc., the sum of $7,357.14.

Since the United States took charge of the work on January 29, 1901, there has been a general increase in the available navigable depth of 5 feet, the available depth on June 30, 1912, being 27 feet.

The usual variation of the water surface is from zero at the mouth to 2 feet at the head of the pass, due to the stage of the river, and from 1.3 feet at the mouth to 0.9 foot at the head, due to tide.

Comparative statement of receipts and shipments for 10 years for the port of New Orleans, La.

Calendar year.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1902	3,385,686		328,183
1903	3,062,506		323,180
1904	2,853,926		208,580
1905	3,478,976	625,050	
1906	4,023,156	544,180	
1907	3,527,097		496,059
1908	3,088,472		438,625
1909	3,368,722	280,250	
1910	3,964,109	595,387	
1911	4,487,726	523,617	

No detailed data or statistics are at hand showing the effect on freight rates of the increased depth of channel. The number of deep-draft steamers has increased, and being able to carry full cargoes, the earnings and business of the port of New Orleans have increased and the freight rates decreased. The magnitude of the commerce of the port of New Orleans is best illustrated by the tabulated commercial statistics above. These figures are necessarily incomplete, as it is impracticable to secure statements covering all the receipts and shipments for any given period. It may be safely assumed, however, that the total greatly exceeds that shown in the above comparative statement.

MAINTENANCE OF SOUTH PASS, MISSISSIPPI RIVER, 1911.

[Act June 6, 1900.]

July 1, 1911, balance unexpended		$28,178.62
Amount received from Southern Pacific Co. to cover cost of repairs to jetty, which was damaged by their steamship *El Norte*		724.93
Total		28,903.55
June 30, 1912, amount expended during fiscal year:		
For maintenance of improvement	$28,178.62	
March 26, 1912, amount reverted to Treasury during fiscal year 1912	724.93	
		28,903.55

MAINTENANCE OF SOUTH PASS CHANNEL, MISSISSIPPI RIVER.

[Act Mar. 2, 1907.]

July 1, 1911, balance unexpended	$12,285
July 1, 1912, balance unexpended	12,285
July 1, 1912, outstanding liabilities	12,285

PRESERVATION AND MAINTENANCE OF RIVER AND HARBOR WORKS FOR SOUTH PASS CHANNEL, MISSISSIPPI RIVER.

[Act Mar. 3, 1909.]

July 1, 1911, balance unexpended	$59,453.09
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	[1] 1,475.39
July 1, 1912, balance unexpended	57,977.70
July 1, 1912, outstanding liabilities	2,794.36
July 1, 1912, balance available	55,183.34

MAINTENANCE OF SOUTH PASS CHANNEL, MISSISSIPPI RIVER.

[Act June 25, 1910.]

July 1, 1911, balance unexpended	$40,000
July 1, 1912, balance unexpended	40,000

MAINTENANCE OF SOUTH PASS CHANNEL, MISSISSIPPI RIVER, 1912.

[Act June 6, 1900.]

July 1, 1911, amount appropriated by the emergency river and harbor act of June 6, 1900	$100,000.00
Amount transferred by Treasury Department from appropriation Transportation of the Army and its Supplies, 1912, account docking quartermaster's launch	22.87

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[1] The amount expended for maintenance of improvement is divided as follows:

As per vouchers	$1,473.52
Treasury settlements	1.87

Amount transferred by Treasury Department from appropriation general expenses, Lighthouse Service, 1912, account coal furnished tender *Arbutus*	43.68
Miscellaneous receipts during fiscal year deposited to credit of appropriation	1,402.69
Total	101,469.24
June 30, 1912, amount expended during fiscal year for maintenance of improvement	50,055.98
July 1, 1912, balance unexpended	51,413.26
July 1, 1912, outstanding liabilities	15,194.56
July 1, 1912, balance available	36,218.70
July 1, 1912, amount covered by uncompleted contracts	15,218.70

MAINTENANCE OF SOUTH PASS, MISSISSIPPI RIVER.

CONSOLIDATED

July 1, 1911, balance unexpended		[1] $239,916.71
Amount received from various sources		2,194.17
		242,110.88
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	$79,709.99	
Amount reverted to Treasury	724.93	
		80,434.92
July 1, 1912, balance unexpended		161,675.96
July 1, 1912, outstanding liabilities		30,273.92
July 1, 1912, balance available		131,402.04
July 1, 1912, amount covered by uncompleted contracts		15,218.70

(See Appendix S 2.)

3. Examinations and surveys at South Pass, Mississippi River.—The act of March 3, 1875, authorizing improvement and maintenance of South Pass by James B. Eads, or his representatives, required examinations and surveys to be made at South Pass, Mississippi River, and reports upon the depth of water and width of channel secured and maintained from time to time in said channel, together with such other information as the Secretary of War might direct.

The act of August 11, 1888, made available an annual appropriation of $10,000 for this work, and the act of June 13, 1902, directed the continuation of the examinations and surveys, notwithstanding the termination of the contract with the late James B. Eads and associates.

The act of May 28, 1908, authorized the use of funds from this appropriation in dredging shoals in the river between Cubits Gap and Head of Passes where necessary to secure a depth of 35 feet with practical width.

To January 28, 1901, when the United States took over the maintenance and improvement of South Pass, examinations and surveys were carried on under the acts of March 3, 1875, and August 11, 1888. From January 29, 1901, to June 30, 1902, examinations and surveys were carried on with funds appropriated by act of June 6, 1900, for maintenance of South Pass. Since June 30, 1902, they have been continued under the act of June 13, 1902.

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[1] Including amount of $100,000, which became available July 1, 1912, under act of June 6, 1900.

To June 30, 1912, there has been expended on this work the sum of $375,288.17. The sum of $5,504.11 reverted to the Treasury.

The surveys made have consisted of the jetty channel, the channel beyond the jetties to deep water in the Gulf, of shoaler localities in the pass, and of the whole pass.

Discharge measurements have also been made of each of the passes during high water.

Statement of expenditures on account of appropriation for examinations and surveys at South Pass, Mississippi River, from July 1, 1911, to June 30, 1912, inclusive, made in compliance with the river and harbor act of June 13, 1902.

Services	$8,680

EXAMINATIONS AND SURVEYS AT SOUTH PASS, MISSISSIPPI RIVER, 1911.

July 1, 1911, balance unexpended	$680
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	680

APPROPRIATION FOR FISCAL YEAR 1912.

July 1, 1911, amount appropriated by river and harbor act of June 13, 1902, for fiscal year 1912	$10,000
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	8,000
July 1, 1912, balance unexpended	2,000
July 1, 1912, outstanding liabilities	2,000

(See Appendix S 3.)

4. *Bayou Plaquemine, Grand River, and Pigeon Bayous, La.*—Bayou Plaquemine, prior to 1867, was an outlet of the Mississippi River and at high water formed a navigable route between the Mississippi River and the Atchafalaya River and its tributaries. It extends southwesterly about 11 miles from the Mississippi at Plaquemine, La., to Grand River, an arm of the Atchafalaya. In 1867 the officials of Iberville Parish, without known warrant of law, separated it from the Mississippi by extending the river levee across its head. From an examination made in 1880 it was found to be much obstructed for the first 5 miles below its head with stumps, logs, and sawmill refuse, and so shoal as to be entirely dry in places at low water. For the remaining 6 miles the bayou had a depth of 10 feet and over at low water and a width of 200 to 300 feet, but was badly obstructed in the same manner.

Grand River forms one of the channels of the Atchafalaya River, and extends from Butte-la-Rose to Flat Lake, near the lower end of Grand Lake, about 90 miles, being joined by Bayou Plaquemine 28 miles below its head.

Pigeon Bayous consist of Pigeon Bayou and its outlet tributary, Little Pigeon Bayou, and connect Grand River and Grand Lake, flowing from the former stream 15 miles below the mouth of Bayou Plaquemine.

In their original condition Grand River and Pigeon Bayous were much obstructed with snags, logs, rafts, fallen and overhanging trees, and shoals, but otherwise had a depth of 10 feet and over at low water, except in one reach of Grand River, known as Bay Natchez, where only 4 to 4½ feet of water existed at low water. Flat Lake, at the lower end of Grand River, also carried only 4 to 4½ feet at low water.

The present project, adopted August 11, 1888, is based on congressional legislation according to project and estimate submitted in 1887 (Report of Chief of Engineers, 1887, p. 1405) and provides for a water route from the lower Atchafalaya to the Mississippi River at Plaquemine, La., by dredging a channel in Bayou Plaquemine 60 feet wide and 6 feet deep from deep water to the Plaquemine Dike, constructing a lock connecting the bayou with the Mississippi River, securing the mouth of the bayou against further caving, and removing obstructions from Grand River and Pigeon Bayous, at a total estimated cost of $1,708,250, which was subsequently increased to $1,740,000. The project of 1887 was modified April 10, 1899, to provide for dredging a channel in Bayou Plaquemine 10 feet deep at low water and a 95-foot bottom width.

The act of June 3, 1896, authorized continuing contracts to be made to complete the project of improvement not to exceed $1,173,250, exclusive of the amounts therein and previously appropriated. Of this amount $1,160,000 was subsequently appropriated.

By act of March 3, 1905, $35,000 was appropriated for maintenance of improvements; and contracts not to exceed $100,000, exclusive of the amounts theretofore appropriated, were authorized for completing improvement. The latter amount was appropriated by act of June 30, 1906. The act of March 2, 1907, appropriated $100,000 for "construction of a dredge and maintenance."

On June 29, 1907, $35,000 was allotted by the Chief of Engineers for emergency work on the lock, $10,000 from the emergency appropriation act of March 3, 1905, $10,000 from the emergency appropriation act of March 2, 1907, and $15,000 from appropriation for operating and care of canals, act of July 5, 1884.

Plans for the lock were prepared in 1891 and were referred to a board of engineers for consideration and report, whose report estimated the cost of the lock, including purchase of the necessary land, at $700,000. A complete revision of the lock plans was made and approved in 1897, due to the increased flood height in the Mississippi River. Land for the lock site and approaches, comprising 11.06 acres, was secured in 1894 and 1902, and the lock built under various contracts and by hired labor from 1895 to 1909.

Work on the lock approaches, connecting levees, and back fill was begun in 1902, continued under various contracts, and completed in May, 1911.

The work of securing the mouth of Bayou Plaquemine against further caving was placed under the officer in charge of the fourth district of the Mississippi River on May 15, 1889, and so remained till September 24, 1894, during which time 5 submerged spur dikes were constructed, 3 above and 2 below the proposed entrance to the lock. The protection extends 2,500 feet above and 1,500 feet below the entrance, and the intervals between the dikes are protected by mattresses for 1,200 feet above the entrance and 1,400 feet below, forming a continued protection except for about 500 feet in front of the lock. The cost of this work was $205,721.29.

In 1901 and 1902 two mattresses were constructed and placed, under contract, near the upper dike, No. 1, at a cost of $52,794.93.

Work on the improvement of Grand River and Pigeon Bayous was performed at various times by a United States dredge and hired dredges from 1893 to 1901, removing some 200,000 cubic yards of material, 18,000 snags, trees, etc., and 4¼ miles of raft. Channels 50 feet wide and 10 feet deep were dredged, under contract, in Bay Natchez and Flat Lake from 1902 to 1904, 369,198 cubic yards of material being excavated. In 1910 shoals were dredged and 439 snags, logs, etc., removed in the waterway from Plaquemine to Morgan City. Twelve hundred cubic yards of material were removed from the channel in Bay Natchez, and 65 piles driven to replace certain of the piles originally driven to mark the channel in that bay and in Flat Lake.

The reports on examinations and surveys of Bayou Plaquemine will be found in the Annual Reports of the Chief of Engineers for 1882, page 1416, and 1887, page 1407.

The project, as modified to date, accordingly provides for a water route from the lower Atchafalaya River to the Mississippi River at Plaquemine, La., by means of a lock at Plaquemine, a dredged channel 10 feet deep and 95 feet bottom width through the shoals of Bayou Plaquemine and the removal of snags, overhanging trees, and other obstructions.

Under the project for a channel in Bayou Plaquemine a 60-foot channel 6 feet deep was dredged by a United States dredge from deep water to the Plaquemine Dike, between 1889 and 1894. The 10-foot channel was commenced in 1899 and completed during the past year.

There was purchased at Dardennes Bend 12.3 acres of land and at Devils Elbow 1.8 acres for the rectification of the bayou under the modified project.

Operations during the fiscal year have consisted in the completion of the contract made July 15, 1899, for dredging in Bayou Plaquemine according to the project for improvement; in dredging a channel about 1,300 feet long through shoals in Bayou Plaquemine by the U. S. *Ram*, and in removing snags, overhanging trees, etc., and in cutting off three obstructive points from the route between Plaquemine, La., and Flat Lake by the U. S. dredge *Delatour*.

The amount earned by the contractor, Charles Clarke & Co. for dredging in Bayou Plaquemine, dredging and enlarging the end of bayou and dredging at the river approach to Plaquemine Lock during the year, was about $6,000.

The total amount paid under the contract and supplemental agreements was $188,031.48.

The expenditures during the year were $43,467.54, of which $27,929.53 was for work of improvement and $15,538.01 for maintenance.

To June 30, 1912, there had been expended on the existing project the sum of $1,892,937.51, of which $48,901.87 was for maintenance. There has been derived from miscellaneous sources, sales, etc., the sum of $53.54.

There is now a waterway from the Mississippi at Plaquemine, La., through Bayou Plaquemine, Grand River, and Flat Lake, with a depth of 10 feet or more at low water and a least width of 50 feet, except where dredging has not been completed in Bayou Plaquemine and at one or two points in Flat Lake and Bay Natchez, where shoaling has occurred and a low-water depth of only 5 to 6 feet is available. Pigeon Bayous are navigable at high water, but obstructions which have formed prevent their use by boats in low water. The fluctuations of Bayou Plaquemine and upper Grand River are from 8 to 9 feet, due to flood water, the fluctuation of lower Grand River and Flat Lake being from 1 to 2 feet, due to flood water and tide. The length of the waterway from Plaquemine to the lower Atchafalaya River is about 80 miles. Pigeon Bayous have an aggregate length of about 20 miles.

Comparative statement of receipts and shipments for 10 years.

Calendar years.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1902	292,000	9,000	
1903	302,500	10,500	
1904	318,000	15,500	
1905	706,000	388,000	
1906	572,000		134,000
1907	534,744		37,256
1908	553,916	19,172	
1909	937,950	384,034	
1910	742,716		195,234
1911	801,419	58,703	

As this improvement forms a through water route from Bayou Teche to the Mississippi River the effect on freight rates is given in the report of that improvement.

July 1, 1911, balance unexpended		$120,413.99
Receipts from sales during the fiscal year		.45
		120,414.44
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$27,929.53	
For maintenance of improvement	15,538.01	
		[1] 43,467.54
July 1 1912, balance unexpended		76,946.90
July 1, 1912, outstanding liabilities		227.49
July 1, 1912, balance available		76,719.41

(See Appendix S 4.)

5. *Operating and care of Plaquemine Lock, La.*—The Plaquemine Lock connects the Mississippi River with the Atchafalaya River and tributaries by way of Bayou Plaquemine.

It has an available length of 265 feet, a width of 55 feet, and a depth over sills at low water of 10 feet, and a lift, dependent on the stage of the Mississippi, varying from 0 to 28 feet. The lock is equipped with a power house and office building, and a lockmaster's dwelling is located near the lock. The United States property in the vicinity of the lock comprises 11.06 acres.

The lock was placed in the status of finished works July 1, 1909.

The sum of $14,706.75 was expended during the year.

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[1] Amount expended is divided as follows:

Treasury settlement	$623.80
As per vouchers	42,843.74

To June 30, 1912, there has been expended on the work of operating and care of Plaquemine Lock the sum of $56,917.34.

Operations during the fiscal year have consisted in the operation and care of lock and in the care of grounds and buildings.

The freight passing through the lock for the calendar year amounted to 126,989 tons, valued at $5,337,951.

Comparative statement of commerce since lock was opened July 1, 1909.

Calendar year.	Short tons.	Change, etc. (increase).
1909—July 1 to Dec. 31	12,091	
1910	115,539	
1911	126,989	11,450

OPERATING AND CARE OF PLAQUEMINE LOCK, LA.

Fiscal year 1911.

July 1, 1911, balance unexpended and covered by outstanding liabilities	$1,950.88
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,950.88

Fiscal year 1912.

July 19, 1912, allotted by the Secretary of War for expenditure during fiscal year 1912:		
Unexpended balance on hand June 30, 1911	$11,891.74	
Additional allotment	22,948.26	
		34,840.00
June 30, 1912, amount expended during fiscal year, for maintenance of improvement		12,755.87
July 1, 1912, balance unexpended		22,084.13
July 1, 1912, outstanding liabilities		6,278.97
July 1, 1912. balance available		15,805.16

(See Appendix S 5.)

6. *Bayou Teche, La.*—Bayou Teche, an important commercial stream of southern Louisiana, has its source in Bayou Courtableau in St. Landry Parish, and flows in a southeasterly direction a distance of 124 miles to where it joins the lower Atchafalaya River, about 12 miles above Morgan City, La. It is an outlet of Bayou Courtableau during periods of high water and was formerly, at times, navigable to its head, but at present owing to lack of depth there is little navigation above St. Martinville, 75 miles above its mouth. The bed of the upper Teche just below the Courtableau is now 5½ feet above low water in that stream. The current during low-water season is very sluggish, as the Teche has no tributaries and the only water it then receives is that from rainfall on the very narrow watershed, generally less than 1 mile wide, adjacent to the stream. The bayou has a width varying from about 70 feet at St. Martinville to 350 feet near its mouth, and is reported in its original condition to have possessed a depth of 8 feet as far as St. Martinville at low water. At the time of the first survey by the United States in 1870

it was found to be much obstructed with logs, snags, fallen and overhanging trees, and wrecks.

The original project, adopted July 11, 1870, provided for the removal of obstructions from the head to the mouth of the stream and under this project they were removed in 1871 and 1872 from the mouth to St. Martinville. In 1880 and 1881 obstructions were removed under contract from St. Martinville up to Leonville, a further distance of 37 miles, and in 1885 and 1886 obstructions were removed from New Iberia to the head of the bayou by a United States snag boat and hired labor. These improvements were not permanent, as other obstructions formed.

The total expenditures under the project of 1870 were $45,004.43; the sum of $5,022.48 reverted to the Treasury from the appropriation of 1870, including the sum of $448.75 derived from sale of property.

In 1891 that portion of the stream above St. Martinville was reported as unworthy of further improvement, and the project for improvement since that year has consisted in the removal of obstructions and dredging at various times below that point. The works of improvement have not been permanent, and the stream has been gradually shoaling for years, due to the sediment carried into the stream from drainage ditches and from the washing of the banks by passing boats. The improvements and works of maintenance have been of benefit to commerce on the bayou, however, and without them this stream might not now be navigable.

The existing project is the project of 1891, as modified by act of March 2, 1907, and provides for a 6-foot navigation to Arnaudville, 106 miles above the mouth of the bayou, by dredging, removal of snags, and the construction of a lock, in accordance with the report submitted in House Document No. 527, Fifty-ninth Congress, first session, at an originally estimated cost of $111,000, which on account of unusual conditions, was increased in 1911 to $195,000.

The expenditure for a 6-foot navigation to Arnaudville was contingent on all lands necessary for lock and dam purposes, and canal feeders being deeded to the United States free of cost and upon the United States being secured against possible claims for damages resulting from the overflow of lands by reason of the lock and dam improvement or from the draining of Spanish Lake. This last requirement was effected by the submission of personal bonds to an amount of $10,000 covering a period of 10 years, which were approved by the department, as it was impossible to secure bonds in perpetuity. Land for the lock and dam site, consisting of 12.27 acres, was deeded to the United States, and the deeds, approved by the Attorney General April 23, 1909, were recorded May 1, 1909, in book No. 70, pages 559–563, at St. Martinville, parish of St. Martin, La.

Operations during the fiscal year have consisted in work by hired labor on the lock at Keystone. About 23,700 cubic yards of material were removed from the lock site, and the driving of round piling in the lock foundation and the construction of the reenforced concrete abutment were completed. Construction of the lock floor, the guard crib, and the dam were commenced, and the lockkeeper's dwelling was nearly completed. Work of clearing the banks of trees, etc., as high as the level of the upper pool was completed over a distance of 10 miles.

Maintenance by open channel work.—In 1908 a channel was dredged through the bars below New Iberia, and in 1911 dredging was done through shoals below Jeanerette. There was no work of maintenance during the past fiscal year.

There has been expended during the fiscal year the sum of $113,939.51 for works of improvement.

To June 30, 1912, there has been expended on the existing project the sum of $215,803.17, of which $15,793.04 was for maintenance, $4,293.53 for resurvey of the bayou in 1905, and $195,716.60 for works of improvement.

It is estimated that on June 30, 1912, the project was 60 per cent completed.

The head of navigation is considered to be at St. Martinville, 75 miles from the mouth, though the stream is navigable in fact 15 miles farther up. The depth at mean low water varies from 8 feet at the mouth to 4 feet at St. Martinville. The oscillation of the water surface due to flood water is about 12 feet in the upper and 3 to 4 feet in the lower part. There is also a small oscillation at low water in the lower part of the stream, due to tides.

Comparative statement of receipts and shipments for 10 years.

Calendar year.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1902	404,454	68,871	
1903	450,542	46,088	
1904	362,706		87,836
1905	701,243	338,537	
1906	706,091	4,848	
1907	580,216		125,875
1908	515,679		64,537
1909	999,125	483,446	
1910	857,804		141,321
1911	810,459		47,345

There is no evidence as yet of any effect on freight rates, but since the opening of the Plaquemine Lock a boat line has been established between Teche points and New Orleans, with rates considerably lower than corresponding railroad rates.

For references as to the progress of the work, see page 1901 of the Annual Report Chief of Engineers for 1904.

Report on resurvey of Bayou Teche, directed by the river and harbor act of March 3, 1905, is printed in House Document No. 527, Fifty-ninth Congress, first session (Annual Report Chief of Engineers for 1906, p. 392).

It is believed that the $25,000 estimated for expenditure for works of improvement during the fiscal year 1914 will be sufficient to complete the work in accordance with the approved project, and is necessary to make the improvement available. The $15,000 estimated for maintenance of the improvement will be spent in dredging and removing snags and other obstructions in this stream.

July 1, 1912, balance available	$210, 407.53
July 1, 1912, amount covered by uncompleted contracts	39, 304.00

(See Appendix S 7.)

8. Inland waterway from Mermentau River, La., to Sabine River, La. and Tex.—The purpose of the improvement is to provide a canal from Mermentau River, La., to Sabine River, La., which will be a continuation of the waterway from Franklin to Mermentau River, La., now in course of construction.

The original, which is the existing project, was adopted by Congress in the river and harbor act approved June 25, 1910, and contemplates a waterway, with a depth of 5 feet at mean low water and a bottom width of 40 feet, with proper side slopes, between the rivers named, in accordance with the reports submitted in House Document No. 640, Fifty-ninth Congress, second session, and Rivers and Harbors Committee Document No. 3, Sixty-first Congress, second session, at an estimated cost of $390,000, and $20,000 annually for maintenance.

The act adopting the project authorizes the expenditure of the amount appropriated on any modified plan for that section of the waterway that may be recommended by the Chief of Engineers and approved by the Secretary of War. The right of way must be furnished without cost to the United States.

For further information concerning this improvement reference is invited to the Annual Reports of the Chief of Engineers for 1875, pages 879 et seq.; for 1908, page 1498; for 1909, page 1467; for 1910, page 1612; and for 1911, page 542.

Report on the preliminary examination, with plan and estimate of cost of improvement, directed by the river and harbor act of March 3, 1905, is printed in House Document No. 640, Fifty-ninth Congress, second session (Annual Report of the Chief of Engineers for 1907, page 451).

No modification has been made in the existing project since its adoption.

Operations during the year have consisted in the examination of various probable routes and the adoption, between the Calcasieu and Sabine Rivers, of the line for the greater portion of its length one-half mile north of the boundary line between Calcasieu and Cameron Parishes, making the connection between the Calcasieu and Sabine Rivers practically a straight line, and in efforts to secure the rights of way.

The route selected involves the expenditure of $27,000 more than the amount required for another route to the southward, but this difference in cost has been provided for by the voluntary contribution of that sum by local interests.

Deeds for this section of the waterway were submitted to the Attorney General for approval, and have been returned for minor corrections. These corrections are now being made and are about completed.

Specifications were prepared for dredging of this section, but advertisement will not be made until the right of way has been approved and the $27,000 contributed by local interests is placed in the hands of the disbursing officer for expenditure.

The rights of way are being procured for the section between the Mermentau and Calcasieu Rivers.

The amount expended during the fiscal year is $2,039.12 for survey and office expenses.

The total amount expended on the project up to the close of the fiscal year ending June 30, 1912, is $2,709.16.

There has been received from sales the sum of 40 cents.

The amount estimated for the fiscal year ending June 30, 1914, will be applied to the construction and completion of the waterway in accordance with the approved project.

The river and harbor act approved July 25, 1912, made an appropriation of $100,000, with the provision that this amount may be applied to any modified plan for this section of the waterway that may be recommended by the Chief of Engineers and approved by the Secretary of War.

July 1, 1911, balance unexpended	$99,329.96
Amount received from sales during fiscal year 1912	.40
	99,330.36
June 30, 1912, amount expended during fiscal year, for works of improvement	[1] 2,039.12
July 1, 1912, balance unexpended	97,291.24
July 1, 1912, outstanding liabilities	17.23
July 1, 1912, balance available	97,274.01
Amount appropriated by river and harbor act approved July 25, 1912	100,000.00
Amount available for fiscal year ending June 30, 1913	197,274.01
Amount (estimated) required to be appropriated for completion of existing project	[2] 190,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[2] 190,000.00

(See Appendix S 8.)

9. Calcasieu River and Pass, La.—Calcasieu River is an important stream in southwestern Louisiana, having its source in Vernon Parish and flowing in a generally southern direction to the Gulf of Mexico. About 22 miles from the Gulf it debouches into Calcasieu Lake. The connection between the Lake and the Gulf, about 7 miles long, is known as Calcasieu Pass.

The head of navigation on the river in 1881, according to a report of an examination made at that time, was at Jones Bluff, 48 miles above the head of Calcasieu Lake, or 28 miles above the city of Lake Charles, La., though boats occasionally navigated the stream for 12 miles farther. The river above Jones Bluff was badly obstructed with snags, logs, fallen and overhanging trees, and sand bars. Timber obstructions existed to a considerable degree as far down as Lake Charles, but were found only occasionally below that point. Above Jones Bluff the river was very crooked, with an average width of from 100 to 150 feet and a depth of about 5 feet. From there to

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[1] The amount expended for works of improvement is as follows:

Treasury settlement	$7.45
As per vouchers	2,031.67

[2] Exclusive of amount available for fiscal year 1913.

Calcasieu Lake it originally had an average depth of 10 feet at low water, with widths varying from 200 to 600 feet.

Calcasieu Lake is 15 miles long, has an average width of 4 miles and a depth over the middle portions at mean low water of 6 feet. It is very shallow near the shores. It was obstructed by a bar near its head, where the Calcasieu River entered it, over which a depth of only 5 feet could be carried at low water. A bar with but 3½ feet over it also existed in the lower end of the lake where the river leaves it. Calcasieu Pass has an average width of 600 feet and depth of 12 feet and more at low water, except in front of the mouth in the Gulf where a bar exists, over which there was originally a varying depth of 5½ to 6½ feet at mean low sea level.

The original project of 1872 provided for the dredging of a channel 80 feet wide and 5 feet deep at mean low water through the bar in the lake near the head of Calcasieu Pass.

This project was modified in 1881 so as to provide for redredging the channel to 70 feet wide and 8 feet deep, and was further modified in 1886 so as to provide a channel 100 feet wide and 6 feet deep protected by a plank revetment on each side and in addition to dredge a channel 100 feet wide and 6 feet deep through the bar at the head of Calcasieu Lake. Due to the destruction of the plank revetment by sea worms the project was modified in 1888 so as to omit the revetment. Under this project a channel 6,300 feet long, 60 feet wide, and 6½ feet deep at mean low tide was dredged in 1873 and 1874 across the bar at the head of the pass. This channel having filled, a channel 7,500 feet long, 70 feet wide, and 8 feet deep was dredged through the bar in 1881 and 1882. By 1885 this channel had shoaled to 3½ feet and from 1886 to 1888 a channel 100 feet wide and 6 feet deep was dredged across the bar and 13,408 linear feet of plank revetment built before this construction was abandoned. A channel 6 feet deep and 100 feet wide was also dredged through the bar at the head of the lake in 1888.

There was expended on the original project with modifications the sum of $46,488.05, including $244.54 expended for examination of Calcasieu River, and office expenses from appropriations made in 1881, 1882, and 1884 for Calcasieu River, the balance of which was authorized by the act of 1886 to be expended on the mouth and passes. The sum of $76.55 reverted to the Treasury from the appropriation of 1872.

The existing project for Calcasieu Pass was adopted by the act of September 19, 1890, and is based on a report made in 1886. (Annual Report Chief of Engineers for 1887, p. 1402.) It provides for the construction of two converging jetties about 1½ miles long of brush and stone at the Gulf entrance to the pass and dredging between them if necessary to secure a 12-foot channel from the Gulf into the pass at an estimated cost of $600,000 so as to make the pass available for a harbor. The act of July 13, 1892, added the improvement of the bars at the head and foot of Calcasieu Lake, the approved project for which improvement provided for channels 8 feet deep through these bars and the revetment of the channels at an estimated cost of $150,000. (Report of the Chief of Engineers for 1891, p. 1829.) The existing project has not been otherwise modified.

References to examination or survey reports not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Calcasieu Pass					1871	557
Phillips Bluff to head of Calcasieu Lake.					1881	1301
Lake Charles to pass					1883	1127
Jones Bluff to Gulf	House	724	Fifty-ninth	First		

None of the above contain maps.

Two jetties at the mouth of the pass were commenced in 1892. At this date the east jetty is 8,447 feet long and the west jetty 3,200 feet. Repairs to the jetties have also been made at various times.

A channel was dredged through the bar at the head of the pass in 1893 and 1894 and 10,000 linear feet of pile and slab revetment built in 1892 and 1893 to protect this channel. The revetment was damaged by a storm in 1893 and repaired. A channel 50 feet wide and 8 feet deep was dredged in 1894 and 1895 through the bar at the head of the lake. The channel over the bar near the head of the pass was redredged in 1898 for a length of 8,063 feet, a width of 50 feet, and a depth of 8 feet, and in 1902 a shell reef which had formed was dredged from the channel. The channel was again redredged in 1902 and 1903 to a width of 60 feet and a depth of 8 feet for a length of 5,770 feet.

In 1905 a survey was made of the lake and pass from the head of the lake to the Gulf and in 1906 and 1907 a channel 24,000 feet long, 100 feet wide, and 7 feet deep was dredged through the bar at the head of the pass and 8,230 feet of the old revetment along this channel rebuilt. This channel was redredged in 1911 to a depth of 8 feet through a length of about 8,000 feet.

A channel 10,000 feet in length, 100 feet wide, and 7 feet deep was also dredged in 1906 through the bar at the head of the lake, and channels dredged were marked with pile clusters. For maintenance of this and other improvements a combined dredge and snag boat was constructed in 1908 and 1909.

The first appropriation for maintenance was made by the act of March 2, 1907.

There were no field operations during the fiscal year. The expenditures were for the collection of commercial statistics, for a pro rata share of repairs to the U. S. dredge *Delatour*, and for payment of outstanding liabilities incurred during the previous fiscal year.

The sum of $6,784.86 was expended during the year for maintenance.

There has been expended on the existing project to June 30, 1912, the sum of $587,857.20, of which it is estimated that $138,521.62 has been applied to maintenance.

There has been derived from miscellaneous sources, sales, etc., the sum of $2.50.

The existing project is considered completed, the present work being for maintenance.

At the beginning of operations the depth over the bar at the mouth of Calcasieu Pass was 5½ feet; present depth, 7 feet; over bar at head of the pass, 3½ feet; present depth, 8 feet. The maximum draft which can be carried from the Gulf of Mexico to Lake Charles is 6 feet at low water (mean low Gulf level), the variation being about 2 feet.

No work of improvement has been carried on in Calcasieu River above the lake. Logs are rafted on suitable stages from points 30 to 40 miles above Jones Bluff. The usual variations of the water surface in the river are from 18 to 20 feet in the upper reaches and 6 to 8 feet in the lower reaches.

Comparative statement of receipts and shipments for 10 years.

Calendar year.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1902	148,483	9,438	
1903	194,155	45,672	
1904	226,216	32,061	
1905	295,067	68,851	
1906	314,235	19,168	
1907	355,795	41,560	
1908	360,252	4,457	
1909	554,551	194,299	
1910	387,873		166,678
1911	404,805	16,932	

Certain special rates from New Orleans to Lake Charles and West Lake, La., on the Calcasieu River, are quoted in the tariff of Morgan's Louisiana & Texas Railroad & Steamship Co. on account of water competition.

For references as to progress of the work, see page 1910 of the Annual Report of the Chief of Engineers for 1904.

July 1, 1911, balance unexpended	$21,866.01
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	6,784.86
July 1, 1912, balance unexpended	15,081.15
July 1, 1912, outstanding liabilities	492.36
July 1, 1912, balance available	14,588.79

(See Appendix S 9.)

10. Bogue Falia, Amite, Chefuncte, and Tickfaw Rivers, La.—These streams prior to 1902 had been improved under separate appropriations, but were combined by the act of June 13, 1902.

(*a*) *Chefuncte River and Bogue Falia.*—The Chefuncte River and its tributary, Bogue Falia, form an important waterway in southeastern Louisiana, the Chefuncte emptying into Lake Pontchartrain on its north shore almost directly opposite the city of New Orleans, La.

The Chefuncte, from the Bogue Falia to its mouth, about 10 miles, has a width of from 250 to 800 feet and a depth of from 15 to 30 feet. It was obstructed by a bar at its mouth over which a depth of only 5½ feet existed at ordinary low water, or 4½ feet at the lowest water, and also by snags, logs, fallen and overhanging trees. For 3 miles above the junction with the Bogue Falia navigation was practicable only for the smallest schooners and timber rafts, the remainder of the stream, because of its tortuous channel and rapid current, not being navigable. Improvement above the junction has consisted only in the removal of snags, sunken logs, etc., in the first 3 miles.

Bogue Falia is navigable and has been improved as far as Covington, La., about 4 miles above its junction with the Chefuncte, and to this point has widths of 60 to 250 feet and had depths of from 4 to 20 feet. It was obstructed by snags, logs, fallen and overhanging trees, shoals, and several wrecks, and prior to improvement could be navigated to Covington only by the smallest schooners.

Tide water extends to Covington on the Bogue Falia. Considerable commerce existed on these streams prior to improvement, and for the year ending July 1, 1871, 710 vessels were reported as arriving in New Orleans from the Chefuncte.

The act of 1872 appropriated $6,000 for the removal of the wreck of the gunboat *Oregon* from the Chefuncte; the work was performed in 1872 and 1873 at a cost of $5,221.

The existing project, adopted March 3, 1881, is based on a report made in 1880 (Report of the Chief of Engineers for 1880, p. 1181), which contemplated dredging through the bar at the mouth of the Chefuncte and the removal of snags, overhanging trees, etc., to Covington on the Bogue Falia, at an estimated cost of $5,460.

This project was modified in 1884 so as to provide for a channel 100 feet wide and 7 feet deep across the bar at the mouth of the Chefuncte, and the construction of about 2,500 feet of breakwater to the east of the dredged channel for its protection, the estimated cost of the dredging and breakwater being $20,400. In 1886 dredging of channels 5 feet deep, through shoals in the Bogue Falia, was authorized. In 1889 the project was modified so as to include only the removal of snags and similar obstructions at an annual cost of $1,000. In 1894 further modification of the original project was made so as to include the dredging of shoals in the Bogue Falia to a width of 60 feet and a depth of 6 feet. In 1899 the project was modified so as to provide a channel 60 feet wide and 6 feet deep through the bar at the mouth of the Chefuncte.

The project was again modified in 1902 so as to provide for dredging a channel over the bar at the mouth of the Chefuncte 6 feet deep at extreme low water or 7 feet deep at ordinary low water and as wide as available funds would permit. Further modification in 1910 provided for a channel 7 feet deep at extreme low water over the bar.

Reference to examination and survey reports not in project document.

Section covered.	Annual reports of Chief of Engineers.	
	Year.	Page.
Covington to Lake	1871	551
Do	1880	1181
25 miles above Covington to Lake	1884	1223
Chefuncte River, 4 miles above junction, to Lake	1884	1268
Covington to Lake	1889	1529
Do	1895	1785

The project for improvement, as modified to date, provides for a channel from the mouth of the Chefuncte River to Covington, on the Bogue Falia, with a minimum depth of 7 feet, by dredging, where necessary, and by the removal of snags, overhanging trees, and other obstructions.

The channel through the bar at the mouth of the Chefuncte River was improved by the construction of a pile breakwater in 1885, and by dredging in 1899, 1902, and 1910. Dredging through the shoals in the Bogue Falia was done in 1887, 1895, and 1910. Snags, trees, etc., were removed in 1882, 1891, 1900, and 1910. For the maintenance of this and other improvements, a combined dredge and snag boat was constructed in 1908 and 1909.

There were no field operations during the fiscal year. Expenditures were for collection of commercial statistics and for a pro rata share of repairs to the dredge *Delatour*, and amounted to $56.15.

Of the amount appropriated by act of June 25, 1910, and allotted to "Improving Tickfaw River and tributaries, La.," $1,000 was withdrawn from that allotment and reallotted to this work.

To June 30, 1912, there has been expended on the works of the existing project the sum of $31,929.47, of which $12,587.23 was for maintenance.

The existing project is considered completed, present work being for maintenance.

Before improvement the maximum depth that could be carried to Covington at low water was about 4 feet, and the channel was badly obstructed. At present, a channel, practically free from obstructions, exists from Lake Pontchartrain to Covington, with a depth of 7 feet.

Variations of the water surface in the upper Chefuncte and Bogue Faria due to flood water is about 8 feet; in the lower Chefuncte and Lake Pontchartrain from 1 to 3 feet, due to wind.

Comparative statement of receipts and shipments for 10 years.

Calendar year.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1901	92,874	6,018	
1902	100,763	7,894	
1904	184,099	83,331	
1905	222,494	38,395	
1906	235,727	13,233	
1907	221,177		14,550
1908	247,887	26,710	
1909	241,977		5,910
1910	375,965	133,988	
1911	350,681		25,284

Due to water competition, Covington has the advantage of reduced railroad freight rates on numerous commodities between that point and New Orleans, certain rates being considerably less than to intermediate points having a shorter haul.

The funds estimated for expenditure during the fiscal year 1914 will be applied to the maintenance of the work in accordance with the project, which is necessary to make the improvement available.

July 1, 1911, balance unexpended	$932. 67
June 15, 1912, amount reallotted from allotment for Tickfaw River	1, 000. 00
	1, 932. 67
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	56. 15
July 1, 1912, balance unexpended	1, 876. 52
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

(*b*) *Tickfaw River and tributaries, La.*—The Tickfaw River and tributaries form a small system of streams in southeastern Louisiana; the Tickfaw flows into Lake Maurepas and is joined by one tributary, the Natalbany, 2 miles above its mouth; by another, the Blood, 8 miles above its mouth. The Ponchatoula is a tributary of the Natalbany, joining it 4 miles above its junction with the Tickfaw.

Prior to improvement, the head of navigation on the Tickfaw was at a point 16 miles above its mouth, the stream to that point having a depth of 9 feet and over at low water and widths of 100 to 500 feet. A bar tends to form at the mouth of the Tickfaw, over which at the lowest water depth of 7 feet existed. Above the sixteenth mile from its mouth the Tickfaw shoaled rapidly, and was exceedingly obstructed with snags, logs, fallen and overhanging trees.

The Natalbany was navigable to Springfield, La., 10 miles above its junction with the Tickfaw, and had a depth of 10 feet to this point, and widths of 100 to 300 feet. The Blood was navigable for 4 miles above its junction with the Tickfaw, having a depth of 10 feet to this point and widths of 80 to 200 feet.

The Ponchatoula was navigable for 4½ miles above its junction with the Natalbany, having a depth of 10 feet and over and widths of 80 feet to 150 feet. All of these streams were obstructed prior to improvement with snags, logs, fallen and overhanging trees from their mouths to the head of navigation, but considerable commerce existed, and at the time of the first examination and survey in 1879 there were 3 to 4 schooners per week engaged in navigating each of these waterways, besides the rafting of considerable timber.

The project under which work of improvement has been carried on is based on a report submitted in 1880 (Report of the Chief of Engineers for 1880, p. 1184), was adopted in 1881, and contemplates the removal of obstructions on the Tickfaw for 26 miles above its mouth; on the Blood River to the head of navigation, 4 miles; and on the Natalbany and Ponchatoula Rivers, 15½ miles, at an estimated cost of $10,230.

Reports on examinations or surveys of these streams may be found in the Annual Reports of the Chief of Engineers for 1880, page 1182; 1883, page 1289; and 1895, page 1786.

The existing project has not been modified since its adoption.

The Tickfaw River was cleared of obstructions in 1882 and 1884; the Blood, Poncatoula, and Natalbany in 1886 and 1887, the project being then reported completed.

Work of maintenance has been carried on by the removal of obstructions every two or three years.

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[1] See consolidated money statement on p. 671.

For maintenance of this and other improvements, a combined dredge and snagboat was constructed in 1908 and 1909.

The work of removing obstructions from the Ponchatoula River as far as Wadesboro, was completed at the beginning of the fiscal year.

The sum of $1,844.20 was expended during the year, and $1,000 of the amount appropriated by act of June 25, 1910, and allotted to this stream, was withdrawn and allotted to Chefuncte River and Bogue Falia.

To June 30, 1912, there has been expended on the works of existing project the sum of $22,157.46, of which $14,041.97 was for maintenance.

The work of improvement on these streams has resulted in the removal of obstructions from portions of the stream that were navigable prior to improvement, and has rendered portions navigable that could not be navigated previously.

The maximum draft that can be carried over the bar at the mouth of the Tickfaw is 6½ feet at mean low water. The usual variations of the water surface are about 9 feet in the upper portions of these streams and 2 to 3 feet at the mouth of the Tickfaw.

The head of navigation on the Tickfaw is at present at a point 16 miles above its mouth, the stream being navigable, in fact, for 5 miles farther. On the Natalbany the head of navigation is at the parish bridge, 12 miles above its mouth; on the Blood, 4 miles above its mouth; and on the Ponchatoula, 5 miles above its mouth.

Comparative statement of receipts and shipments for 10 years.

Calendar year.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1901	56,464	924	
1902	45,632		10,832
1904	86,302	40,670	
1905	45,429		40,873
1906	34,690		10,739
1907	44,350	9,660	
1908	41,101		3,249
1909	47,571	6,470	
1910	114,108	66,537	
1911	117,449	3,341	

As there are no railroads in the section adjacent to the navigable portions of these streams there is no effect on freight rates due to the improvement.

The funds estimated for the fiscal year 1914 will be applied to the maintenance of the work in accordance with the approved project, which is necessary to make the improvement available.

July 1, 1911, balance unexpended		$4,844.20
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	$1,844.20	
June 15, 1912, amount withdrawn and reallotted to Chefuncte River	1,000.00	
		2,844.20
July 1, 1912, balance unexpended		2,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		(1)

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[1] See consolidated money statement on p. 671.

(c) *Amite River and Bayou Manchac, La.*—The Amite River and its tributary, Bayou Manchac, lie in southeastern Louisiana, the Amite flowing into Lake Maurepas on its western shore. Bayou Manchac joins the Amite River from the west about 37 miles above its mouth. The Amite from Lake Maurepas to Bayou Manchac is a tide-water stream and has widths of 200 to 300 feet and depths of 10 to 30 feet except at its mouth where a bar exists on which a depth of 5 to 6 feet existed at low water. This section prior to improvement was somewhat obstructed with snags, logs, fallen and overhanging trees. For a distance of about 73 miles above Bayou Manchac the Amite had widths of 100 to 200 feet and depths at low water of 2 to 15 feet, being badly obstructed with snags, logs, fallen and overhanging trees, and sand bars.

Bayou Manchac from its mouth to Hope Villa, about 9 miles, has a width of 100 to 200 feet and depths of 8 to 15 feet except at its mouth in the Amite where a bar exists over which there was originally a depth of 4 to 5 feet at low water. This section was slightly obstructed with logs, snags, fallen and overhanging trees. The bayou can be considered navigable above Hope Villa for 4 miles only, as the upper bayou goes dry in low water and is exceedingly obstructed with snags, logs, trees, etc.

Prior to improvement some navigation existed on the lower Amite and Bayou Manchac and a small steamer made regular trips to Hope Villa on the Manchac.

The project under which works of improvement have been carried on was adopted in 1880 and is based on a report submitted in 1880 (Report, Chief of Engineers, 1880, p. 1185), and contemplates the removal of obstructions to a depth of 5 feet from the Amite River to a point about 73 miles above Bayou Manchac, at an estimated cost of $23,760.

In 1888 the improvement of Bayou Manchac was added to the project, in accordance with a report made in 1882 (Annual Report of the Chief of Engineers for 1882, p. 1415), and contemplating the removal of obstructions from the mouth of the Manchac to a point about 11 miles upstream, at an estimated cost of $3,450.

Project for the Amite was modified in 1883 so as to omit that portion of the stream above the Manchac and in 1889 so as to include 5 miles of the Amite above Bayou Manchac. The improvement is not considered permanent, as obstructions will continue to form from time to time. The dredging of a turning basin for boats at Wards Creek, on the Manchac, 10½ miles above its mouth, was authorized in 1892.

Project was modified in 1902 so as to provide for redredging a channel through the bar at the mouth of the Amite, 8 feet deep, and as wide as available funds would permit, and in 1905 so as to dredge the bar at the mouth of the Manchac to the same depth.

Reports on examinations or surveys of these streams may be found in the Annual Reports of the Chief of Engineers for 1880, page 1185; 1882, page 1415; 1889, pages 1513 and 1528.

The existing project, as modified to date, provides for the removal of obstructions from the Amite River from its mouth to 5 miles above the mouth of Bayou Manchac, and from Bayou Manchac from its mouth to Wards Creek, and for dredging channels 8 feet deep through the bars at the mouth of Amite River and Bayou Manchac.

Work of improvement was carried on by the removal of obstructions from the Amite River between 1881 and 1884, and from Bayou Manchac in 1890 and 1891, by the dredging of a turning basin at Wards Creek in 1895, and by dredging channels through the sand bars in 1899 and 1900. The obstructions have been removed from time to time as they re-formed, and the channels have been redredged twice.

In 1908 and 1909 a combined dredge and snag boat was constructed for maintenance of this and other improvements.

Operations during the fiscal year have consisted in the removal of snags, overhanging trees, etc., from Amite River from its mouth to the mouth of Bayou Manchac, and from Bayou Manchac from its mouth to the turning basin at the mouth of Wards Creek.

The sum of $5,769.55 was expended during the year for maintenance.

To June 30, 1912, there has been expended on the existing project the sum of $58,827.03, of which $33,926.21 was for maintenance.

The project is considered completed, present work being for maintenance. The improvements have resulted in the removal of obstructions to navigation and in increasing the depth over bars. The lengths of the navigable portions of both streams have also been increased.

The maximum draft that can be carried is 6½ feet—over the bar at the mouth of Amite River. The variations of the water surface in Lake Maurepas are about 2 feet, due to winds; in the Manchac and upper Amite, 6 to 12 feet, due to freshets.

The head of navigation on the Amite River is considered to be about 5 miles above the mouth of Bayou Manchac, on Bayou Manchac, at the turning basin, just above Hope Villa.

Comparative statement of receipts and shipments for 10 years.

Calendar year.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1901	69,918	44,518	
1902	44,694		25,224
1904	120,851	76,157	
1905	43,371		77,480
1906	50,669	7,298	
1907	45,552		5,117
1908	43,558		1,994
1909	56,745	13,187	
1910	76,616	19,871	
1911	40,788		35,828

There are no definite data as to the effect of the improvement on freight rates, as the territory adjacent to the navigable portions of these streams is practically without railroads.

The funds estimated for the fiscal year 1914 will be applied to the maintenance of the work in accordance with the project, which is necessary to make the improvement available.

July 1, 1911, balance unexpended	$7,436.53
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	5,769.55
July 1, 1912, balance unexpended	1,666.98
July 1, 1912, outstanding liabilities	125.50
July 1, 1912, balance available	1,541.48
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

CONSOLIDATED.

July 1, 1911, balance unexpended	$13,213.40
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	7,669.90
July 1, 1912, balance unexpended	5,543.50
July 1, 1912, outstanding liabilities	125.50
July 1, 1912, balance available	5,418.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2] 7,000.00

(See Appendix S 10.)

11. Channel, bay, and passes of Bayou Vermilion and Mermentau River and tributaries, La.—These streams prior to 1902 had been improved under separate appropriations, but were combined by the act of June 13, 1902.

(a) *Channel, bay, and passes of Bayou Vermilion.*—Bayou Vermilion is the first stream in southern Louisiana west of and not connected with the Atchafalaya River. It flows into the western end of Vermilion Bay through two outlets known as the Passes. It is considered navigable to Lafayette, 52 miles above its mouth, where it is crossed by the fixed bridge of the Morgan's Louisiana & Texas Railroad & Steamship Co., and has widths below this point varying from 50 to 400 feet and depths of from 4 to 20 feet at low water.

Prior to improvement it was navigable at its higher stages to a point 49 miles above its mouth, but was obstructed, principally in the upper reaches, with snags, logs, fallen and overhanging trees, and shoals over which a depth of only 2 feet at low water existed.

It was also obstructed by a bar at its mouth over which there was a depth at low tide of only 2 feet. Considerable navigation existed on the bayou by steamers and flatboats prior to the construction of the railroads to Lafayette and Abbeville.

The project under which work of improvement has been performed was adopted in 1880, and is based on reports of that year (Report of the Chief of Engineers for 1880, pp. 1156 and 1164), recommending the removal of obstructing timber so as to afford a depth of 5 feet at low water as far as the railroad bridge, and also the closure of one of the passes at an estimated total cost of $9,900. This project was modified in 1892 so as to provide a depth of 5½ feet to the railroad bridge and the marking of the channel in Vermilion Bay with guide piles at an estimated cost of $25,000 additional. The work was not considered permanent, as other obstructions formed from time to time.

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[1] See consolidated money statement on this page.
[2] Exclusive of the balance unexpended July 1, 1912.

References to examination or survey reports not in project documents.

Section covered.	Congressional documents				Annual reports of Chief of Engineers.	
	House or Senate.	No	Congress.	Session.	Year.	Page.
Lafayette to mouth					1880	1164
Lafayette to Abbeville					1887	1398
Lafayette to mouth					1891	1856
Do	House	1218	Sixtieth	Second		

None of the above reports contain maps.

The project, as modified to date, provides for a channel 5½ feet deep at low water (mean low Gulf level) from the mouth to the railroad bridge just below Lafayette, by removing obstructions and by dredging through the shoals.

Obstructions were removed in 1881 from the first 22 miles below the railroad bridge, and in 1882 and 1883 the remainder of the bayou was cleared to the mouth and 650 feet of a brush dam constructed, partly closing the eastern pass or outlet of the bayou into Vermilion Bay.

In 1892 and 1893 snagging operations were performed for 18 miles above the mouth of the bayou and the channel into Vermilion Bay marked with piling, and in 1895 obstructions were removed from the upper 26 miles of the stream. In 1899 and 1900 similar work was performed over some 30 miles of the stream below the railroad bridge, and at obstructed places in 1902, 1903, 1906, 1907, and 1908.

A combined dredge and snag boat, for service on this and other improvements, was completed in August, 1909. This boat operated from the mouth to the railroad bridge in 1910, securing the channel contemplated by the project. The channel through the bar at the mouth was marked by piling.

Operations during the fiscal year have consisted in the removal of fallen trees and other obstructions by the U. S. dredge *Delatour*, for a distance of about 30 miles from the mouth of the bayou, under an allotment made from the appropriation for emergencies in river and harbor works.

The sum of $1,251.81 was expended during the year for maintenance.

The sum of $1,800 of the amount appropriated by act of June 25, 1910, and allotted to this work was withdrawn and reallotted to Bayou Plaquemine Brule, La.

To June 30, 1912, there had been expended on the existing project the sum of $57,312.89, of which $22,412.89 was for maintenance.

The project is considered completed, present work being for maintenance. Work of improvement has resulted in increasing the maximum draft and the ease of navigation.

The maximum draft that can be carried at low water (mean low Gulf level) over the bar at the mouth of Bayou Vermilion is about 2 feet, and a depth of 4 feet can be carried to Lafayette at ordinary stages of water. The usual variation of the water surface at the mouth is 1 to 2 feet, due to tide, and at the railroad about 12 feet, due to flood water.

Comparative statement of receipts and shipments for 10 years.

Calendar year.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1902	37,000	5,615	
1903	15,157		21,843
1904	29,326	14,169	
1905	28,092		1,234
1906	32,025	3,933	
1907	37,515	5,490	
1908	26,589		10,926
1909	31,593	5,004	
1910	26,428		5,165
1911	29,151	2,723	

No data is at present available showing the effect of the improvement on freight rates, but it is understood that the town of Abbeville, La., enjoys reduced railroad freight rates owing to its location on this waterway.

The funds estimated for expenditure during the fiscal year 1914 will be applied to the maintenance of the work in accordance with the project, which is necessary to make the improvement available.

July 1, 1911, balance unexpended		$2,538.92
Apr. 23, 1912, amount allotted from appropriation for emergencies in river and harbor works, act Mar. 3, 1905		3,000.00
		5,538.92
June 30, 1912, amount expended during fiscal year:		
For maintenance of improvement	[1] $1,251.81	
Aug. 3, 1911, Nov. 11, 1911, amount withdrawn and reallotted to Bayou Plaquemine Brulé	1,800.00	
		3,051.81
July 1, 1912, balance unexpended		[2] 2,487.11
July 1, 1912, outstanding liabilities		1,281.77
July 1, 1912, balance available		1,205.34
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		500.00
Amount available for fiscal year ending June 30, 1913		1,705.34
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		([3])

(*b*) *Mermentau River and tributaries, La.*—The Mermentau River lies in southern Louisiana and is formed by the junction of Bayou Nezpique and Bayou des Cannes, 2 miles above the town of Mermentau, at the crossing of the Southern Pacific Railroad. It flows in a southwesterly direction for 70 miles and empties into the Gulf of Mexico, after passing through Lake Arthur, Grand Lake, Upper

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[1] The amount expended for works of improvement is as follows:

Regular allotments for Bayou Vermilion	$70.15
Allotment from emergency appropriation	1,181.66
	1,251.81

[2] Balance unexpended is divided as follows:

Regular allotments for Bayou Vermilion	668.77
Allotment from emergency appropriation	1,818.34
	2,487.11

[3] See consolidated money statement on page 677.

Mud Lake, and Lower Mud Lake. It differs from the streams between it and the Mississippi River by having several tributaries, both Bayou Queue de Tortue joining it from the east 5 miles above the head of Lake Arthur and Bayou Lacassine flowing into Grand Lake from the west, being navigable. Bayou Plaquemine Brule is a tributary of Bayou des Cannes, joining it from the east 3 miles above its mouth.

The Mermentau proper has widths of from 250 to 1,000 feet and low-water depths of 10 feet and over. Through Lake Arthur, which is 6 miles long and averages about 1 mile in width, there is a low-water depth of 7 to 8 feet. Through Grand Lake the channel is about 11 miles long, with an average depth of 6 feet except where the river enters the lake, where a bar exists over which there was originally a depth of only 5 feet, and where the river leaves the lake there is a bar over which a depth of 4½ feet existed at low water. Through Lower Mud Lake there was an available depth at low water of 4 feet, and 4½ feet existed over the bar at the mouth of the river in the Gulf of Mexico. The tributaries of the Mermentau are as a rule exceedingly crooked, with widths from 50 to 200 feet and depths of 6 feet and over at low water, and are much obstructed with snags, logs, fallen and overhanging trees. Navigation on these tributaries extended for 10 to 25 miles above their mouths, and prior to improvement considerable commerce existed on them and the main stream.

The project under which work of improvement has been carried on was adopted in 1892, based on a report submitted the previous year (Report Chief of Engineers, 1892, p. 1862), and contemplates the removal of snags, etc., from the Mermentau and for about 25 miles on Bayou Nezpique and the construction of brush dams in Lower Mud Lake, so as to deepen the channel by scour at a total estimated cost of $23,615.25.

In 1897 dredging, in connection with brush dams, was authorized, so as to secure a channel 50 feet wide and 6 feet deep through Lower Mud Lake.

Reports on examinations or surveys of these streams may be found in the Annual Report of the Chief of Engineers for 1891, pages 1858 and 1862.

Report of a preliminary examination or survey of Mermentau River, with a view to securing a permanent channel at least 20 feet deep, directed by the river and harbor act of March 3, 1905, is printed in House Document No. 178, Fifty-ninth Congress, first session. (Annual Report of Chief of Engineers for 1906, p. 411.)

Report of examination and survey of Bayou Queue de Tortue, with plan and estimate of cost of improvement, directed by the river and harbor act of March 3, 1909, is printed in House Document No. 609, Sixty-first Congress, second session. (Annual Report of Chief of Engineers for 1910, p. 529.)

The project for the improvement of Mermentau River and tributaries, as modified to date, provides for the removal of obstructions from the mouth of the Mermentau River to a point about 25 miles above the mouth of Bayou Nezpique and for a channel 50 feet wide and 6 feet deep through Lower Mud Lake. The improvement of Bayou Plaquemine Brule, a tributary of the Mermentau River, as authorized by act of June 25, 1910, is carried as a separate project, not yet being completed.

Under the project for improvement and maintenance, obstructions were removed from 38 miles of the Mermentau and Nezpique above Lake Arthur in 1892 and 1893.

In 1897 and 1898 channels were dredged through two shoals in Lower Mud Lake to an average depth of 8 feet and a width of 50 feet and two pile and brush dams 2,500 and 3,000 feet long, respectively, constructed. In 1899 the dredged channels having shoaled, they were redredged to a depth of 6½ feet for a length of 3,877 feet.

In 1902 it was found that the lower brush dam, due to greater influx of salt water, had been practically destroyed by the teredo, and repairs were limited to the upper dam.

In 1906 obstructions were removed from Bayou Nezpique for a distance of 21 miles below the head of navigation in that stream.

In 1908 and 1909 a combined dredge and snag boat was constructed and equipped for maintenance of improvement, being partially paid for from funds from the Mermentau River and tributaries.

There were no field operations during the fiscal year. Expenditures were for the collection of commercial statistics and for a pro rata share of repairs to the dredge *Delatour*, and during the year amounted to $157.01.

The sum of $2,000 appropriated by act of June 25, 1910, and allotted to this work was withdrawn and reallotted to Bayou Plaquemine Brulé, La.

To June 30, 1912, there had been expended on the existing project the sum of $36,101.67, of which $9,986.42 was for maintenance.

The project is considered completed, the present work being for maintenance.

The improvements have resulted in unobstructed channels and increased depths on the Mermentau and Nezpique.

The maximum draft that can be carried at low water (mean low Gulf level) over the shoals in Lower Mud Lake and over the bar at the foot of Grand Lake is 3 to 4 feet.

The head of navigation on Bayou Nezpique is now at a point 25 miles above its mouth, on the other tributaries from 10 to 15 miles above their mouths.

The usual variations of the water surface in the upper portions of the Mermentau and its tributaries are from 8 to 15 feet, in the lower Mermentau about 2 feet, the fluctuations resulting from heavy winds being greater than those due to tides.

Comparative statement of shipments and receipts for 10 years.

Calendar year.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1902	50,326	21,085	
1903	63,690	13,364	
1904	45,836		17,824
1905	42,413		3,453
1906	61,634	19,221	
1907	49,756		11,878
1908	44,882		4,874
1909	33,094		11,288
1910	29,518		3,576
1911	23,362		6,156

On account of its location on this waterway the town of Mermentau has lower railroad rates on certain articles than intermediate points.

The funds estimated for expenditure during the fiscal year 1914 will be applied to maintenance of the work in accordance with the approved project, and is necesary to keep the improvement available.

July 1, 1911, balance unexpended		$3,470.59
June 30, 1912, amount expended during fiscal year:		
For maintenance of improvement	$157.01	
Aug. 3, 1911, amount withdrawn and reallotted for Bayou Plaquemine Brulé	2,000.00	
		2,157.01
July 1, 1912, balance unexpended		1,313.58
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		500.00
Amount available for fiscal year ending June 30, 1913		1,813.58
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		(1)

(*c*) *Bayou Plaquemine Brulé, La.*—The improvement of Bayou Plaquemine Brulé in accordance with project given in House Document No. 789, Sixtieth Congress, first session, at an estimated cost of $10,000, with $250 annually for maintenance, was authorized by the river and harbor act of June 25, 1910, and provides for the removal of snags, logs, and other obstructions, to provide a clear channel width of 60 feet and depth of about 6 feet, beginning at the mouth of the bayou and extending upstream to a point near the town of Crowley, a distance of approximately 29 miles.

Reports on preliminary examination or survey of Bayou Plaquemine Brulé, with plan and estimate of cost of improvement, directed by the river and harbor act of March 2, 1907, were submitted December 19, 1907, and February 7, 1908, and are printed in House Document No. 789, Sixtieth Congress, first session. (Annual Report of the Chief of Engineers for 1908, p. 449.)

The existing project has not been modified since its adoption.

Work of improvement was commenced by the U. S. combined dredge and snag boat *Delatour* on June 30, 1911, and continued until November 8, 1911, when operations were suspended, due to exhaustion of available funds. Overhanging trees, snags, etc., were removed from about half the length of the route and a channel dredged through one point, completing about one-third of the project.

The sum of $1,800 from the amounts allotted to Mermentau River and tributaries, La., and $2,000 to Bayou Vermilion, La., act of June 25, 1910, were withdrawn and reallotted to this work.

The sum of $8,165.79 was expended during the fiscal year for works of improvement.

To June 30, 1912, there has been expended $8,216.19 for works of improvement.

In an effort to improve the stream as far as practicable with the amount available only the most obstructive trees and snags were removed for a distance of nearly 15 miles, or one-half the length of the improvement, and one point was cut through in straightening the channel.

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[1] See consolidated money statement on page 677.

The entire length of the improvement will have to be gone over, removing the remaining trees and snags from the lower portion, and all from the upper reach of the work, and do the work of dredging where necessary. The work is not sufficiently advanced to permit navigation. No bench marks have been established.

The amount estimated for expenditure during the fiscal year 1914 is toward completion of work in accordance with the approved project and the work proposed is necessary to make the improvement available.

July 1, 1911, balance unexpended	$4, 949. 60
Amount reallotted from allotments for Mermentau River and Bayou Vermilion	3, 800. 00
	8, 749. 60
June 30, 1912, amount expended during fiscal year, for works of improvement	8, 165. 79
July 1, 1912, balance unexpended	583. 81
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	4, 000. 00
Amount available for fiscal year ending June 30, 1913	4, 583. 81
Amount (estimated) required to be appropriated for completion of existing project	[1] 21, 200. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	([2])

CONSOLIDATED.

July 1, 1911, balance unexpended		$10, 959. 11
April 22, 1912, amount allotted from appropriation for emergencies in river and harbor works (act Mar. 3, 1905), for restoration of channel in Bayou Vermilion		3, 000. 00
		13, 959. 11
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$8, 165. 79	
For maintenance of improvement	1, 408. 82	
		9, 574. 61
July 1, 1912, balance unexpended		4, 384. 50
July 1, 1912, outstanding liabilities		1, 281. 77
July 1, 1912, balance available		3, 102. 73
Amount appropriated by river and harbor act approved July 25, 1912		5, 000. 00
Amount available for fiscal year ending June 30, 1913		8, 102. 73
Amount (estimated) required to be appropriated for completion of existing project		[1] 21, 200. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 16, 200. 00

(See Appendix S 11.)

12. Bayou Lafourche, La.—Bayou Lafourche prior to 1902 was an outlet of the Mississippi River, its head being at Donaldsonville, 80 miles above New Orleans. Under authority of the act of June 13, 1902, authority to close it at its head was granted, under certain conditions, to the joint organization of the Atchafalaya and Lafourche levee boards of the State of Louisiana, by extending the river levee across it. From the Mississippi to its mouth in the Gulf of Mexico it has a length of 107 miles, with widths varying from 75 to 150 feet. According to a report submitted in 1874 it was obstructed prior to improvement with stumps, snags, wrecks, and sand bars, depths over the latter being as little as 2½ feet at low water, though otherwise the bayou had depths of from 4 to 10 feet at low water.

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[1] Exclusive of amount available for fiscal year 1913.
[2] See consolidated money statement on this page.

The original project, adopted in 1878, provided for the removal of stumps and snags from 42 miles of the bayou below Thibodeaux, La., this place being 34 miles below the head of the stream, at an estimated cost of $10,000. This project was modified in 1879 so as to extend operations to the head of the bayou and dredge the upper bayou to a depth of 4 feet at low water. It was further modified in 1884 so as to carry operations downstream as far as necessary and available funds would permit. Under this project a working plant was constructed and snags, stumps, and wrecks removed for 86 miles below the head of the bayou from 1878 to 1885, there being expended on the project the sum of $29,920.39.

The existing project, adopted August 11, 1888, is based on a report submitted in 1886 (Report of the Chief of Engineers for 1886, p. 1266) and contemplates a lock at the head of the bayou and a channel 75 feet wide and 5 feet deep at extreme low water in the bayou below the proposed lock, by dredging, at an estimated cost of $450,000. That part of this project which contemplates securing a navigable channel, by dredging, at an estimated cost of $240,000 was adopted by Congress in 1888. Project was modified in 1896 so as to hold the matter of construction of the lock in abeyance and restrict operations to maintenance of low-water navigation in the upper part of the bayou, by dredging, at an estimated cost of $25,000 per annum. Under authority of the act of June 13, 1902, the levee boards named above were authorized to close the head of Bayou Lafourche with a dam for a period of two years and six months, pending construction of a lock at the head of the bayou by the levee boards.

Act of April 13, 1904, extended this time three years, and the act of March 2, 1907, extended the time to January 1, 1910. Plans were drawn for the lock and duly approved by the Secretary of War, but it was found that the lock would cost a larger sum than was obtainable, and there the matter was allowed to rest until the fall of 1909. Plans are now being drawn for another lock, which, it is believed, can be built for an amount within the resources of the board, and it is expected that they will shortly be submitted for approval.

The project as modified to date provides for the maintenance of a channel at least 75 feet wide and 5 feet deep throughout the bayou at extreme low water. A lock connecting the bayou with the Mississippi River at Donaldsonville is to be constructed by the joint organization of the Atchafalaya and Lafourche levee boards.

Under the existing project work began in 1888 and was continued annually during the low-water seasons till 1902, the work consisting principally in the dredging of shoals in the upper 10 miles of the stream, though operations of dredging and removal of obstructions were on several occasions carried farther downstream, extending from

38 to 100 miles below the head of the bayou. These improvements kept the stream clear of obstructions and maintained navigation between the Mississippi and the bayou during the low-water seasons through the bars at the head of the bayou, which formed annually on account of the deposits of sediment from the river.

The channels dredged were, as a rule, 60 feet wide and from 3 to 4 feet deep at low water.

Since 1902 no dredging has been carried on in Bayou Lafourche by the United States pending the construction of the lock or the removal of the dam at its head.

Operations during the fiscal year have consisted in the removal of 10 sunken and abandoned barges and 24 snags, stumps, etc., at a cost of $458.06.

A survey of the entire bayou, from its head to mouth, was made, work beginning in January and completed about May 1, at a cost of $4,746.21. The survey was made for the purpose of locating drainage ditches and placing the responsibility for obstructions.

The sum of $5,435.48 was expended during the fiscal year.

To June 30, 1912, there had been expended on the existing project the sum of $233,666.06, of which $13,150.97 was for maintenance. The sum of $1,914.83 reverted to the Treasury on June 30, 1909.

The stream is navigable and navigated to within a short distance of the dam at its head, and the maximum draft which can be carried over the shoalest part of the upper bayou is 4 feet at low water.

The usual variations of the water surface under present conditions is that due to tide being from 1 to 2 feet in the lower bayou and a few inches in the upper part.

Comparative statement of receipts and shipments for 10 years.

Calendar year.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1902	132,745		4,612
1903	94,351		38,394
1904	66,839		27,512
1905	94,320	27,481	
1906	59,092		35,228
1907	46,433		12,679
1908	64,914	18,501	
1909	70,618	5,704	
1910	80,935	10,317	
1911	115,749	34,814	

The effect of the work of improvement on freight rates is not definitely known.

Commerce on the bayou has an outlet to the Mississippi through two toll canals, viz, the Harvey Canal and the Company Canal.

The funds estimated for expenditure during the fiscal year 1914 will be applied to maintenance of work in accordance with the approved project, necessary to keep the improvement available.

July 1, 1911, balance unexpended	$7,434.20
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	5,435.48

July 1, 1912, balance unexpended	$1,998.72
July 1, 1912, outstanding liabilities	91.26
July 1, 1912, balance available	1,907.46
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 2,000.00

(See Appendix S 12.)

13. Removing the water hyacinth from waters in Louisiana and Texas.—The water hyacinth is an aquatic plant which infests the waters of the Gulf coast, increasing with great rapidity during the summer season and greatly obstructing navigable waterways. It is a floating plant and is propagated not only by seed but by the development of new plants from the root stems or portions of the root. It made its appearance in the waters of southern Louisiana about 1884 and spread with such rapidity that it soon infested all of the streams where sufficient current does not exist to carry it to salt water.

The existing project for the destruction of these plants is based on a report submitted in 1898 (Report of the Chief of Engineers for 1899, p. 1615), was adopted in 1899, and originally contemplated the construction and operation of boats equipped with suitable machinery for removing and crushing the plants, and the use of log booms to prevent the plants from drifting from one stream into another, at an estimated cost of $25,000 for a boat, $10,000 for operation, and $1,000 for the establishment of log booms, a total of $36,000.

The act of June 13, 1902, authorized the use of mechanical, chemical, or other means whatsoever for the extermination of the plant, and under this provision the project was modified so as to destroy the plants by chemical instead of mechanical means. Continuation of operations for the removal and destruction of these plants was made possible by the appropriation of 1902 and later appropriations.

Under the existing project a boat with suitable machinery for removing and crushing the hyacinth, at a cost of $17,253.17, was secured and operated in 1900 and 1901 in Bayou Plaquemine, removing the plants at an operating cost of 4.9 cents per square yard. A log boom was also established at the mouth of Bayou Teche to prevent the plants from entering that stream from the Atchafalaya.

With the authorization of the use of chemical means to destroy the plants the use of crushing machinery was abandoned and the boat equipped with a spraying apparatus.

Spraying operations were carried on in 1902 in Bayou Plaquemine and adjacent waters, using the Harvesta chemical compound, a trade article, which proved effective in the destruction of these plants, the operating cost per square yard being 0.37 cent.

Spraying operations were also continued in the waters adjacent to Bayou Plaquemine in 1903 and 1904, and booms were placed in Bayou Plaquemine and several adjacent streams.

Alterations and repairs were made to the boat in 1904, and in 1905 spraying operations were resumed, using a solution prepared from a formula of the Department of Agriculture instead of the Harvesta compound.

This spraying solution is prepared by dissolving 1 pound of white arsenic and 1 pound of sal soda per gallon of water, by boiling for about an hour, and then diluting with about 17 gallons of water preparatory to spraying.

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[1] Exclusive of the balance unexpended July 1, 1912.

The cost of this solution is about one-tenth that of the Harvesta compound, and it is estimated that 1 gallon will destroy 10 square yards of hyacinths.

A second boat was purchased in 1905 and fitted for spraying the plants at a cost of $8,903.57, and since that year the work of removing the plants by spraying and the use of booms and watchmen has been carried on in those streams which are most obstructed or whose commercial importance demands that no obstructions be permitted to form.

The first boat secured for operations in the removal of these plants was dispensed with in 1908, having become unserviceable, and the second boat was overhauled in the same year and altered completely.

These various operations have resulted in removing the worst obstructions from year to year and keeping the most important waterways reasonably free from the hyacinths.

No reasonable amount of money expended can begin to eradicate the plants, however, without the cooperation of local officials and private parties, and even with such cooperation the complete eradication of the plants would be a long and difficult process.

Operations during the fiscal year have consisted in the operation of booms and patrol of streams by watchmen, the establishment of fixed booms at the mouths of small tributaries of navigable streams, and the spraying of the plants in the localities most congested and at the headwaters of navigable streams.

The overflow waters from the Mississippi River during the flood of the spring of 1912 carried a large majority of the water hyacinths in that section of Louisiana between the Mississippi and Bayou Teche to the Gulf of Mexico, and rendered operations in this territory unnecessary during the last few months of the fiscal year. However, sufficient plants were left in the swamps and at various points along the banks of the streams to insure their prompt return in large numbers, and it is doubtful if any permanent improvement will result.

The sum of $13,136.15 was expended during the fiscal year for maintenance.

To June 30, 1912, there has been expended on the existing project the sum of $158,940.04. There has been received from miscellaneous sources, sales, etc., the sum of $1,119.04.

The funds estimated for expenditure during the fiscal year 1914 will be applied to the removal of water hyacinths from the waterways in accordance with the adopted project, which is absolutely necessary to the navigation of many streams.

July 1, 1911, balance unexpended	$39,990.15
Received from sale of United States property and deposited to credit of appropriation	805.00
	40,795.15
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	13,136.15
July 1, 1912, balance unexpended	27,659.00
July 1, 1912, outstanding liabilities	1,007.82
July 1, 1912, balance available	26,651.18
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 15,000.00

(See Appendix S 13.)

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[1] Exclusive of the balance unexpended July 1, 1912.

14. Bayou Terrebonne, La.—Bayou Terrebonne is a small stream in southern Louisiana flowing in a southerly direction from near Thibodaux, La., 65 miles to Terrebonne Bay, an inlet of the Gulf of Mexico.

That portion of the stream, 16 miles long, above Houma, La., is not considered navigable, as in the dry season portions of it go entirely dry.

From Houma to the mouth the bayou has widths varying from 40 feet to 200 feet and more, and prior to improvement had depths of from 4 to 20 feet at low water, but was obstructed in the upper part by shoals, over which a depth of only 2 feet at low water existed, and by some overhanging trees.

Considerable commerce existed on the stream prior to improvement, produce being brought to Houma by water for shipment by rail.

The original project, adopted in 1880, is based on a report submitted in that year (Report of the Chief of Engineers for 1880, p. 1179), and contemplated a channel 4 feet deep at low water below Houma by dredging and the clearing of the banks of overhanging trees, at an estimated cost of $18,800, afterwards increased to $38,800.

Under this project work of dredging was carried on from 1880 to 1887 and a channel 4 feet deep at low water secured for 23½ miles below Houma, La.

A dredge boat was also constructed and partly paid for from the appropriation for this work.

The sum of $38,641.10 was expended on this project, including a portion of the expenses of the construction and repair of the dredge boat, and $158.90 reverted to the Treasury.

Due to a severe storm in September, 1909, Bayou Terrebonne and adjacent waterways became much obstructed by trees, marsh grass, etc., and, under the provisions of the emergency appropriation act of March 3, 1905, allotments aggregating $10,000 were made by the Secretary of War for the restoration of usual channel depths and removal of obstructions. In Bayou Terrebonne 4,550 feet of channel was dredged; in Bush Canal 5,222 feet; and in Bayou Little Caillou 4,400 feet. Bayou Terrebonne was also cleared of obstructions for a distance of 6,260 feet. The cost of this work was $8,422.73, the balance, $1,577.77, reverting to the Treasury.

The existing project, adopted by the river and harbor act of June 25, 1910, is based on a report submitted in House Document No. 1163, Sixtieth Congress, second session, and contemplates securing a channel in Bayou Terrebonne 6 feet deep at low water and of suitable width from Houma to deep water, at an estimated cost of $50,000.

Under the terms of the appropriating clause Congress provided that no portion of the appropriation shall be used for any purpose whatever until the land required for the improvement has been deeded to the United States free of cost, and the river and harbor act approved July 25, 1912, amended this provision by providing that the right of way for the additional width required for excavation and for depositing dredged material shall be given by local interests free of cost to the United States.

As it will probably take considerable time to obtain the necessary easements to the land required for this improvement as contemplated, no expenditure can be made and no estimate for additional funds is submitted.

Other reports of examinations and surveys are given in the Annual Reports of the Chief of Engineers for 1887, page 1396; for 1889, page 1508; and for 1891, page 1843.

Report on the preliminary examination of this stream, with a view to obtaining 6 feet of water, directed by the river and harbor act of March 2, 1907, is printed in House Document No. 1163, Sixtieth Congress, second session. (Annual Report of the Chief of Engineers for 1909, p. 469.)

July 1, 1911, balance unexpended	$25,000
July 1, 1912, balance unexpended	25,000
Amount (estimated) required to be appropriated for completion of existing project	[1] 25,000

(See Appendix S 14.)

15. Atchafalaya River, La., from Morgan City to the Gulf of Mexico.—The Atchafalaya River for 17½ miles, from Morgan City to its mouth in Atchafalaya Bay, an inlet of the Gulf of Mexico, is a stream with a width of 1,500 to 3,000 feet and depth at low water of 26 to 140 feet.

A natural channel 20 feet deep extends into Atchafalaya Bay for a distance of 3½ miles beyond its mouth, but from this point to the 20-foot contour in the Gulf of Mexico there was originally an available depth of only about 7 feet.

Two different channels of 12 and 14 feet, respectively, have been dredged through Atchafalaya Bay by private parties, in order to give an outlet for a considerable commerce which originates at or near Morgan City. The older, or the 12-foot channel, has greatly deteriorated and is now practically abandoned, the present outlet being by way of the 14-foot channel.

The existing project, as adopted by the river and harbor act of June 25, 1910, is based on a report of examination and survey printed in House Document No. 669, Sixty-first Congress, second session, and contemplates securing a channel 200 feet wide and 20 feet deep from the 20-foot contour at the mouth of the Atchafalaya River to the 20-foot contour in the Gulf of Mexico, and its maintenance for three years, at an estimated cost of $530,000, and $10,000 for inspection and superintendence by the United States.

For previous reports of examinations and surveys see Annual Reports of the Chief of Engineers for 1871, page 554; for 1897, page 1779; and for 1900, page 2282.

Reports on the preliminary examination or survey of this stream, with plan and estimate of cost of improvement, with a view to obtaining a channel 240 feet wide and 20 feet deep, were submitted November 5, 1909, and January 22, 1910, respectively, as directed by the river and harbor act of March 3, 1909, and are printed in House Document No. 669, Sixty-first Congress, second session. (Annual Report of the Chief of Engineers for 1910, p. 529.)

The existing project has not been modified since its adoption.

Contract for construction and maintenance of the 20-foot channel was entered into on August 27, 1910, with the Atchafalaya Bay Ship

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[1] Exclusive of the balance unexpended July 1, 1912.

Channel Co., of Morgan City, La., the owners of the 14-foot channel, in accordance with the authority contained in the act adopting the project. Work of construction was completed and the three-year contract for maintenance began on October 14, 1911.

Operations during the fiscal year have consisted in the completion of the channel under the contract and maintenance of the channel since its completion; about 34,850 linear feet of channel was completed and 1,309,183.9 cubic yards of material removed. Quarterly inspections of the completed channel were made and the contractor required to restore the original depth whenever a shoaling of 2 feet or more had occurred.

The sum of $196,959.09 was expended during the fiscal year for works of improvement, of which $196,281.78 was paid the contractor and $677.31 was for inspection services, etc.

To June 30, 1912, there had been expended on the existing project the sum of $501,963.23, all of which was for improvement.

The existing project is completed, present work being for maintenance. The maximum draft has been increased from 7 to 20 feet at low water (mean low gulf level). The variation of water surface is usually 1 to 2 feet. The head of navigation for this draft is at Morgan City.

It is understood that the opening of this channel has resulted in substantial reductions in the freight rates between Morgan City and eastern ports on certain commodities, and that schooners have carried lumber at considerably less than the all-rail or combined rail-and-water rates.

July 1, 1911, balance unexpended	$234,995.86
June 30, 1912, amount expended during fiscal year, for works of improvement	196,959.09
July 1, 1912, balance unexpended	38,036.77
July 1, 1912, amount covered by uncompleted contracts	30,000.00

(See Appendix S 15.)

16. Lake Pontchartrain and Pass Manchac, La.—Lake Pontchartrain is a body of water in southeastern Louisiana, with a length of 40 miles, a width of 23 miles, and a central depth of 16 feet, decreasing regularly to about 6 feet near the shores.

It is connected with Lake Maurepas to the westward by a channel known as Pass Manchac, which has a length of 6½ miles, a width of 800 feet, and a depth of 20 to 50 feet. Bars with about 7 feet of water over them exist in both lakes in front of the pass.

Lake Pontchartrain, prior to improvement, was obstructed by an old United States breakwater near Milneburg on its south shore and by partly submerged logs which were scattered over the lake and were dangerous to navigation.

Pass Manchac was obstructed by sunken logs, etc., on the bars at its outlets, which prevented the full depth of water being utilized by boats navigating it. There were also a number of snags and logs scattered throughout the pass.

The act of August 30, 1852, appropriated $25,000 for the construction of a harbor on Lake Pontchartrain, and under this project the breakwater mentioned above was constructed in 1852 and 1853.

The existing project, adopted by the river and harbor act of June 25, 1910, is based on reports submitted in House Documents Nos. 881 and 882, Sixtieth Congress, first session, and contemplates the improvement of Lake Pontchartrain and Pass Manchac by the removal of the old United States breakwater and dangerous deadheads, as partly submerged logs are called, from Lake Pontchartrain, and the removal of sunken logs, etc., from the bars at the outlet of Pass Manchac, at a total estimated cost of $18,000, with $750 per annum thereafter for maintenance.

References to examination or survey reports not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Lake Pontchartrain, west end to Milneburg.					1882	1890
Lake Pontchartrain, middle grounds.					1891	1839
Lake Pontchartrain, harbor at New Orleans.					1893	1842
Lake Pontchartrain, west end to Milneburg.	House	557	Sixtieth	First		
Lake Pontchartrain	do	881	do	do		
Pass Manchac	do	882	do	do		

None of the above reports contains maps.

The existing project has not been modified since its adoption.

Operations during the fiscal year were carried on by the U. S. snag boat *Pearl*, borrowed from the Mobile (Ala.) district, which was at work on these improvements at the end of the fiscal year 1911. The project was completed by the removal of the remaining piles in the breakwater and of the beacon marking its eastern end, in Lake Pontchartrain, and the removal of about 25 snags in Pass Manchac.

The amount expended during the year was $952.31, of which $703.21 was for Lake Pontchartrain and $249.10 for Pass Manchac.

To June 30, 1912, the sum of $3,460.79 was expended, of which $2,211.69 was for Lake Pontchartrain and $1,249.10 for Pass Manchac, all of which was for improvement.

The project is considered completed, present work being for maintenance. The improvement has resulted in the removal of numerous dangerous obstructions to navigation. The maximum draft which can be carried over the bars in front of Pass Manchac is 7 feet. The variation of water surface, due to winds, is usually 1 to 2 feet.

LAKE PONTCHARTRAIN, LA.

July 1, 1911, balance unexpended	$4,491.52
June 30, 1912, amount expended during fiscal year, for works of improvement	703.21
July 1, 1912, balance unexpended	3,788.31

PASS MANCHAC, LA.

July 1, 1911, balance unexpended	$2,000.00
June 30, 1912, amount expended during fiscal year, for works of improvement	249.10
July 1, 1912, balance unexpended	1,750.90

CONSOLIDATED.

July 1, 1911, balance unexpended	$6,491.52
June 30, 1912, amount expended during fiscal year, for works of improvement	952.31
July 1, 1912, balance unexpended	5,539.21

(See Appendix S 16.)

17. *Improving Bayou Grossetete, La.*—Bayou Grossetete is one of the most important waterways of the Atchafalaya River Basin, lying between that stream and the Mississippi River. Its headwaters are in Pointe Coupee Parish, about opposite the town of Melville, on the Atchafalaya, and it extends in a general south-southeast direction through that parish and Iberville Parish to Bayou Plaquemine, which it enters about 7 miles from the Mississippi, after a course of about 40 miles, without regard to minor sinuosities.

The proposed improvement, adopted by the river and harbor act approved July 25, 1912, is based on a plan for improving the stream by removing snags and trees and dredging a channel 60 feet wide and 5 feet deep from its mouth to above Melville, at an estimated cost of $18,000 and $500 per annum for maintenance, all in accordance with report submitted in House Document 348, Sixty-second Congress, second session, and subject to the conditions set forth in this document.

No work has yet been done.

Amount appropriated by river and harbor act approved July 25, 1912	$18,000
Amount available for fiscal year ending June 30, 1913	18,000

(See Appendix S 17.)

18. *Improving Bayou Queue de Tortue, La.*—Bayou Queue de Tortue is a tributary of the Mermentau River and flows into that stream about 5 miles above the head of Lake Arthur. It rises in the western part of the Parish of Lafayette and flows in a southwesterly and westerly direction between the Parishes of Acadia and Vermilion.

The stream has been surveyed from its mouth to a point 23.9 miles above, the distance being measured along the bayou. The survey was stopped there, as the stream above that point was found to consist of short open stretches of water and straight sections of swamp thickly covered by timber, and any improvement of this portion would involve an outlay entirely out of proportion to the benefits to be derived.

The project adopted by the river and harbor act approved July 25, 1912, is to clear the stream of obstructions from its mouth to the Southern Pacific Railway Bridge, about 19.5 miles above its mouth, by removing snags, logs, fallen and overhanging trees, and also to make a number of cut-offs across such points as are so short as to interfere with safe navigation, at an estimated cost of $25,000, and

$1,000 per annum for maintenance, all in accordance with report submitted in House Document 609, Sixty-first Congress, second session, and subject to the conditions set forth in said document, i. e., that the necessary right of way for the cut-offs is furnished free of cost to the United States.

It is expected that the work will be completed during the fiscal year 1913 and that the funds estimated to be expended during the fiscal year 1914 will be for the maintenance of the improvement.

Amount appropriated by river and harbor act approved July 25, 1912	$25,000.00
Amount available for fiscal year ending June 30, 1912	25,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 1,000.00

(See Appendix S 18.)

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH PROVISIONS OF RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and surveys required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. *Preliminary examination, with plan and estimate of cost of improvement of Bayou Grossetete, La., from its source to Bayou Plaquemine.*—Reports dated May 17 and October 10, 1911, are printed in House Document No. 348, Sixty-second Congress, second session. A plan of improvement at an estimated cost of improvement of $18,000 for first construction is presented.

2. *Preliminary examination of Abita River, from Abita Springs to Bogue Falia, La.*—Report dated May 16, 1911, is printed in House Document No. 428, Sixty-second Congress, second session. The improvement of this stream in the manner proposed is not deemed advisable at the present time.

EXAMINATIONS AND SURVEYS REQUIRED BY THE RIVER AND HARBOR ACTS APPROVED MARCH 3, 1909, JUNE 25, 1910, AND FEBRUARY 27, 1911.

The local officer was also charged with the duty of making preliminary examinations and surveys provided for in the river and harbor acts of March 3, 1909, June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. *Bayou Courtableau, La.*
2. *Bayou Teche, La., with a view to securing increased depth.*
3. *Amite River, La., and Miss.*, from the mouth of Bayou Manchac to a point west of the town of Liberty, in Amite County, Miss.
4. *Bayou Lafourche, La.*, with a view to securing a depth of 20 feet at its mouth.
5. *Bayou Chastaing, La.*

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[1] Exclusive of amount available for fiscal year 1913.

6. *Mermentau River, La.*, with a view to the construction of a lock and dam to maintain the level of Grand Lake and the inland waterways of Louisiana.
7. *Ponchatoula River, La.*
8. *Tangipahoa River, La.*

IMPROVEMENT OF RIVERS AND HARBORS IN THE GALVESTON, TEXAS, DISTRICT.

This district was in the charge of Maj. G. P. Howell, Corps of Engineers, to July 26, 1911, and in the charge of Maj. Earl I. Brown, Corps of Engineers, since that date. Division Engineer, Lieut. Col. Lansing H. Beach, Corps of Engineers.

1. *Galveston Harbor, Tex.*—Galveston Harbor originally embraced an anchorage area of over 1.960 acres, of which 1,500 acres had a depth of more than 20 feet, 1,300 acres had a depth of more than 24 feet, and 460 acres had a depth of more than 30 feet.

The entrance was obstructed by two bars, known as the inner and outer. The natural depth on the inner bar was about 9 feet and on the outer bar about 12 feet. These shallow depths prevented all but the lightest draft vessels from using the harbor and necessitated the lighterage of cargoes to the larger vessels anchored in the deep water beyond the outer bar.

The area of the harbor is now about 258,496 acres, ranging in depth from 24 to 40 feet, of which 79,168 acres is properly the channel from ocean bar to anchorage. Of the 179,300 acres of anchorage about 119,400 acres are over 30 feet in depth.

From Galveston Harbor to Southwest Pass, mouth of Mississippi River, is a distance of about 410 miles east; to Aransas Pass, Tex., 188 miles west; to the mouth of the Brazos River, Tex., 50 miles west.

Prior to 1874 the projects for improving the harbor related to dredging operations on a small scale.

The project for the permanent improvement by jetties was adopted in 1874 and modified in 1880 and 1886. Previous to 1886, $1,478,000 was expended, with an additional sum of $100.000 subscribed by the city of Galveston in 1883.

The 1886 project provided for a certain depth of 25 feet and a possible depth of 30 feet by constructing jetties to a height of 5 feet above mean low tide and extending them to the 30-foot contour in the Gulf and supplementing the action of the tidal scour by dredging. The estimated cost of this revised project was $7,000,000.

The expenditures under the above projects resulted in 1900 in a depth of 26 feet at mean low tide on the outer bar, an increase of 14 feet since work began, and a depth of 26 feet at mean low tide on the inner bar, an increase of 16 feet during the same period.

The south jetty extended 35,603 feet and the north jetty extended 25,907 feet. The amount expended on this project was $7,041,684.42, of which $97,687.85 was for maintenance of the improvement.

The hurricane of September 8, 1900, damaged the jetties to a considerable extent, and a board of engineer officers estimated the cost of repairing the same at $1,500,000. (Annual Report of the Chief of Engineers for 1901, p. 2018.) Appropriations under this estimate commenced June 13, 1902, and were completed in 1906, $1,200,000 being appropriated.

The act of March 2, 1907, appropriated $300,000 and authorized continuing contracts for prosecuting the work to the amount of $700,000 additional, all of which has since been appropriated. In pursuance of the discretion vested in him by this act, the Secretary of War approved a project for expenditure of the funds appropriated and pledged in obtaining a depth of 30 feet by repairing the jetties, by jetty extension, and by dredging, including construction of a new dredge. This dredge, the *Galveston*, began work November 24, 1908.

Additional appropriations, amounting to $730,000, have also been made for maintenance by dredging and repairs to jetties. Of this amount $150,000 has been transferred to the work of improving Galveston Channel.

For more extended information see House Document No. 340, Fifty-ninth Congress, second session, and Rivers and Harbors Committee Document No. 11, Fifty-ninth Congress, second session.

From June 13, 1902, to June 30, 1912, $2,549,531.78 has been expended in accordance with modified project, of which $544,596.12 was for maintenance of improvement. The portion derived from miscellaneous sources, such as sales, etc., is $35,678.74.

During the past fiscal year repairs were made to the portion of the south jetty between the city and Fort Point which was damaged by the storm of July, 1909. The expenditure was $8,515.27, and was for maintenance.

No work was done by the dredge *Galveston* on this improvement during the year. The dredge was on duty in the Savannah (Ga.) engineer district at the beginning of the fiscal year and returned to the Galveston district October 17, 1911. It was working on other improvements until February 23, 1912, when it was laid up on account of lack of work, a small crew being maintained on board for its care and preservation. The expenditure for maintaining the dredge while laid up was $9,732.90, including minor repairs made by the crew, this also being for maintenance.

The dredge *Galveston* was completed and commenced work November 24, 1908. The extension of the jetties has been completed. The project depth of 30 feet has been attained; this channel is 1,200 feet wide at its narrowest point. The approved project is, therefore, completed. The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 33 feet over the outer bar, and 32½ feet over the inner bar. There is a 32-foot channel 800 feet wide. The length of this improved channel from the Gulf to the inner bar at the entrance to the channel leading to the city of Galveston is 6 miles. The mean tide fluctuations on the outer bar are 2 feet and on the inner bar 1.64 feet.

The depth has increased from 12 feet with a tortuous channel in 1888 to a channel about 1,200 feet wide fairly straight, with depth ranging from 30 to 33 feet. Just before the close of the fiscal year the Mallory Steamship Co. ceased using the services of the bar pilots, ship masters doing the work.

A ruling depth of 33 feet below mean low tide is found over the bar with a channel across the bar midway between the jetties showing a least depth of 28¼ feet at mean low tide. No dredging has been performed on Galveston Harbor for over 12 months.

From the outer bar to anchorage is a distance of about 4½ miles. Length of anchorage about 1 mile to the beginning of Galveston Channel.

It is difficult to state what the effect of the project has been upon freight rates. The rates on foreign shipments are much less than they were 10 years ago. Cotton, the chief article of export, of which 2,979,063 bales were exported in the past year, now has an average rate to Liverpool and Hamburg of 40 cents per 100 pounds and to Bremen 42 cents. Ten years ago the rate was 45 to 55 cents.

The deep water to the wharves and consequent elimination of lighterage charges, the increased size of the vessels employed, the presence of the tramp steamer that prevents the regular lines from keeping up the rates, and the increased production in the Southwest have all had their effect. For the effect upon coastwise rates, attention is invited to the remarks under that head on the "Improvement of the Texas City Channel" (p. 693).

All the commerce for Galveston Channel, Texas City Channel, and Port Bolivar Channel comes in through this channel. In addition, the commerce for the Houston Ship Channel, bound in and out from the Gulf, uses this channel. The total volume of this commerce is approximately 3,793,273 short tons, valued at $427,016,385. For details of this tonnage and of the effect of the improvement on freight rates, attention is invited to the reports on the above channels.

It is proposed to expend about $100,000 of funds on hand on additional repairs to the jetties during the coming year.

It is proposed to apply the amount required for expenditure in fiscal year ending June 30, 1914, for maintenance in operating the dredge *Galveston*.

July 1, 1911, balance unexpended	$281,288.83
Proceeds of sales of charts and contact prints	22.65
Rental of dredge *Galveston*	12,509.08
	293,820.56
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	19,358.02
July 1, 1912, balance unexpended	274,462.54
July 1, 1912, outstanding liabilities	1,463.93
July 1, 1912, balance available	272,998.61
Amount appropriated by river and harbor act approved July 25, 1912	75,000.00
Amount available for fiscal year ending June 30, 1913	347,998.61
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]50,000.00

(See Appendix T 1.)

2. *Galveston Channel, Tex.*—This is the channel passing along the wharf front of the city and connecting the same with the jettied entrance channel.

Galveston Channel inside the inner bar had originally a depth varying from 20 feet at Fort Point to 30 feet off Twentieth Street, and again to 20 feet off Thirty-second Street. The width of the channel between the 18-foot contours was about 600 feet. The inner bar had originally a 9-foot depth, but conditions gradually became better until the outer bar, with about 12-foot depth, became the controlling factor. All vessels drawing over 12 feet had to complete their cargoes by lightering after crossing the bar.

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[1] Exclusive of amount available for fiscal year 1913.

Its distance by water to South West Pass, mouth of Mississippi River, is 418 miles east; Aransas Pass, Tex., is 188 miles west.

Appropriations by the United States Government for the channel began in 1902, when $100,000 was appropriated for improving the channel in accordance with the report submitted in House Document No. 264, Fifty-sixth Congress, second session. The act of March 3, 1905, authorized the construction of a dredge, *Col. A. M. Miller*, at a cost not to exceed $125,000.

The act of March 2, 1907, modified the project by providing for the extension of the channel from Fifty-first Street to Fifty-sixth Street, at an estimated cost of $129,310. (See H. Doc. No. 768, 59th Cong., 2d sess.) The act of June 25, 1910, further modified the project by providing, in the discretion of the Secretary of War, at such time as the interests of navigation and commerce demand, for the extension of said channel to Fifty-seventh Street, with a width of 1,000 feet between Fifty-first and Fifty-seventh Streets, in accordance with reports printed in House Document No. 328, Sixty-first Congress, second session.

The adopted project therefore contemplates the excavation of a channel 30 feet deep and 1,200 feet wide from the inner bar to Fifty-first Street and the extension of said channel 1,000 feet wide from Fifty-first Street to Fifty-seventh Street.

The estimated cost of the project as modified is $1,769,710.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, is $1,309,128.48, of which $346,100.31 was applied to maintenance of improvement, and $1,975.57 was derived from miscellaneous sources, such as sales, etc.

During the fiscal year the Government dredge *Col. A. M. Miller* has worked in the channel, completing the redredging of the old channel as far as Twenty-fifth Street, and widening it by new work to full project width of 1,200 feet from Station 0 to Station 5+750.

A total of 2,333,419 cubic yards of material was removed, of which 1,838,850 cubic yards was new material and 494,569 cubic yards was for maintenance. The dredge also excavated a basin in front of the Federal Quarantine Station on Pelican Spit, removing 465,980 cubic yards as new work.

The Government dredge *Gen. C. B. Comstock*, between September 12 and 15, 1911, worked along the east side of the channel between Pier 10 and Fort Point Lighthouse. A total of 15,964 cubic yards of material was removed as new work.

The Government dredge *Galveston*, between October 17, 1911, and February 23, 1912, worked between the outer red beacon and the corner of the dike. A total of 621,265 cubic yards of material was removed as new work.

Under contract a total of 3,614,343 cubic yards of material was removed, of which 2,569,306 cubic yards was as new material, and 1,045,037 cubic yards as maintenance. This work completed the channel to full project width of 1,200 feet from the wharves and to project depth of 30 feet from Twenty-fifth Street to the westernmost slip of the Southern Pacific Docks. Repairs to the west end of the pile and brush dike were completed.

The proportion of the approved project accomplished to June 30, 1912, is 57 per cent. The width of the 30-foot channel is as follows: From the outer red beacon to the dike, a distance of 6,350 feet, 500 to 1,000 feet; thence to Seventeenth Street, a distance of 4,500 feet, 600 to 800 feet; thence to Twenty-first Street, a distance of 1,500 feet, 900 to 1,200 feet; thence to Twenty-fifth Street, a distance of 1,600 feet, 700 feet; thence to Forty-third Street, a distance of 7,200 feet, 700 to 1,200 feet; thence to Forty-sixth Street, a distance of 1,200 feet, a narrow cut. Above this point no work has been done, a distance of 4,800 feet to Fifty-seventh Street. The total length of the channel is 5 miles. The variation of level of water surface is about 1 foot.

The maximum draft that can be carried at mean low water June 30, 1912, from deep water in the Gulf, is 32½ feet as far as Forty-sixth Street.

The commercial statistics for the port are as follows:

Calendar year.	Domestic exports.	Foreign imports.	Coastwise.	Total value.
1911	$215,178,301	$10,280,249	$146,297,574	$371,756,124
1910	206,678,617	4,741,396	166,720,049	378,140,062
1909	182,406,762	4,125,330	137,298,352	323,830,444
1908	202,152,984	5,516,822	218,388,000	426,057,806
1907	236,277,727	7,621,761	203,768,556	447,668,044
1906	170,759,269	3,772,090	349,486,007	524,017,366
1905	140,113,700	3,034,978	971,925,156	515,073,835

The business has increased from a yearly foreign export business in fiscal year 1895 of about $35,000,000 to $218,448,144 in the fiscal year ending June 30, 1912. This port stands second in the value of foreign exports of all the ports in the United States, as the following table shows:

[Compiled from official records published by the Bureau of Statistics, Department of Commerce and Labor, Washington, D. C.]

Ports.	1907–8	1908–9	1909–10	1910–11
New York	$701,062,913	$607,239,481	$651,986,376	$772,552,449
Galveston	161,852,201	189,464,835	173,178,902	220,504,917
New Orleans	159,455,773	144,981,625	140,376,560	172,835,295
Philadelphia	109,261,436	84,286,440	73,966,343	69,963,389
Boston	96,051,068	76,157,558	70,516,789	71,584,062
Baltimore	89,088,505	77,550,058	77,381,507	85,120,843
Savannah, Ga	61,696,360	50,909,156	63,428,155	72,076,945

It is difficult to state what the effect of the project has been upon freight rates. The rate on foreign shipments are much less now than they were 10 years ago. Cotton, the chief article of export, of which 2,735,303 bales were exported in the past year, now has an average rate to Liverpool and Hamburg of 40 cents per 100 pounds, and to Bremen 42 cents. Ten years ago the rate was 45 to 55 cents.

The deep water to the wharves and consequent elimination of lighterage charges, the increased size of the vessels employed, the presence of the tramp steamer that prevents the regular lines from keeping up the rates, and the increased production in the Southwest have all had their effect. For the effect upon coastwise rates, attention is invited to the remarks under that head on the "Improvement of the Texas City Channel" (p. 693).

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintenance and the further widening of the channel.

July 1, 1911, balance unexpended		$457,951.59
Proceeds of sales of contact prints		2.35
		457,953.94
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$244,091.62	
For maintenance of improvement	101,015.23	
		345,106.85
July 1, 1912, balance unexpended		112,847.09
July 1, 1912, outstanding liabilities		51,164.80
July 1, 1912, balance available		61,682.29
Amount appropriated by river and harbor act approved July 25, 1912		100,000.00
Amount available for fiscal year ending June 30, 1913		161,682.29
July 1, 1912, amount covered by uncompleted contracts		33,508.74
Amount (estimated) required to be appropriated for completion of existing project		[1] 494,794.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 325,000.00

(See Appendix T 2.)

3. Channel from Galveston Harbor to Texas City, Tex.—Texas City, Tex., is on the mainland of Texas, about 8 miles northwest of the city of Galveston. The natural depth over the line of this channel before improvement was from 4 to 8 feet. The present general dimensions of the channel are: 34,500 feet long, 200 feet wide by 27 feet deep for the first 5,500 feet out from the wharf, 100 feet wide by 27 feet deep for the next 17,000 linear feet, 100 feet wide by 25 feet deep for the outer 12,000 linear feet.

During 1895 and 1896 a channel 16 feet deep was dredged by the Texas City Terminal Co. at an expense of $146,000. At the time of the adoption of the present project this channel had shoaled to its natural depth.

The river and harbor act of March 3, 1899, provided for deepening the channel north of Pelican Island from Galveston Harbor to Texas City, Tex., to a depth of 25 feet and a width of 100 feet at the bottom at a cost not to exceed $250,000.

The full amount had been expended on the work under this appropriation up to the close of the fiscal year ending June 30, 1905, the Texas City Co. paying the expenses of superintendence, inspection, etc. The channel was dredged 100 feet wide on the bottom and 25 feet deep from Texas City wharves to 25 feet of water in Galveston Harbor, a distance of 34,000 feet.

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[1] Exclusive of amount available for fiscal year 1913.

In addition to the amounts mentioned above, the Texas City Co., according to figures furnished by them, expended $148,906.98 in completing channel, $172,734.58 in digging turning basin and slip, and in 1906 removed 698,222 cubic yards at a cost of $16,028.61 in maintaining channel.

This channel had been redredged three times, at an expenditure of $63,075.72, all of which was for maintenance.

The river and harbor act of June 25, 1910, enlarged the project by appropriating $100,000 for maintenance and for dredging within the limits recommended in the report submitted in House Document No. 328, Sixty-first Congress, second session, with maps, which contemplates extending the channel so as to connect it with the new slip excavated by the Texas City Terminal Co. in front of its new wharf at Texas City. The new channel dimensions are thus 30 feet deep and 200 feet wide, the estimated cost being $410,000.

The river and harbor act of February 27, 1911, made an appropriation of $50,000 and the act of July 25, 1912, $100,000 for continuing the improvement and for maintenance by dredging within the limits recommended in the above-mentioned document.

For modification of the stone dike, recommended in the above report to be placed on the north side of the channel, see House Rivers and Harbors Committee Document No. 1, Sixty-second Congress, first session.

During the present year the channel was redredged to a depth of 27 feet with width of 200 feet, for a distance of 4,400 feet, at the inner end. In this work $20,890.97 was expended for maintenance.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, is $503,941.30, of which $186,726.06 is for maintenance.

The proportion of the 30-foot project accomplished up to June 30, 1912, is 15 per cent. The old project depth of 25 feet has been attained several times, but shoaling very soon lessens the depth. The maximum draft that can be carried June 30, 1912, over the shoalest portion is 18.8 feet, but owing to the softness of the silt, vessels drawing from 20 to 23 feet can pass through the channel. The usual variation of water surface is about 1¼ feet.

The tonnage for the port of Texas City, Tex., has been as follows:

Calendar year.	Foreign exports and imports.		Coastwise, domestic.		Total.	
	Short tons.	Value.	Short tons.	Value.	Short tons.	Value.
1911	145,820	$28,372,487	303,867	$23,151,774	449,687	$51,524,261
1910	72,694	14,542,428	813,046	33,300,767	885,740	47,843,195
1909	38,799	3,074,444	141,200	31,064,000	179,999	34,138,444
1908	59,072	3,403,960	96,927	18,201,566	155,999	21,605,525
1907	58,245	4,466,173	19,219	2,401,600	77,464	6,867,773
1906	58,258	3,697,757			58,258	3,697,757
1905	60,321	5,362,977			60,321	5,362,977
1904	36,138	3,745,888			36,138	3,745,888

The effect of the project on freight rates has been beneficial owing to the establishment of a line of steamers from New York to Texas City, thereby breaking up the rate agreement that had existed between the old lines between New York and Galveston. Prior to the establishment of this line in 1908 the rates by the steamship lines from New York and points in seaboard territory to points in Texas were the highest figures that ever were in effect, notwithstanding the fact that the deepening of the Galveston Harbor Channel had been continuously going on and at that date the depth was about 30 feet. But with the competing line in operation to Texas City the rates were reduced on an average of 51¼ per cent and the volume of the business increased over 300 per cent. However, during the present fiscal year the rates were advanced again, the average increase being about 75 per cent over the rates of the previous year.

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the present 25-foot channel and to increasing it to 30 feet as far as possible.

July 1, 1911, balance unexpended	$27,138.97
Proceeds of sales of contact prints	.75
	27,139.72
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	21,078.62
July 1, 1912, balance unexpended	6,061.10
Amount appropriated by river and harbor act approved July 25, 1912	100,000.00
Amount available for fiscal year ending June 30, 1913	106,061.10
Amount (estimated) required to be appropriated for completion of existing project	[1] 224,872.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 200,000.00

(See Appendix T 3.)

4. Channel to Port Bolivar, Tex.—Port Bolivar Channel is at the end of Bolivar Peninsula about 4 miles north of the city of Galveston. Before improvement there was no natural channel nor harbor at this locality. The depth in front of the Gulf & Interstate Railroad transfer wharf was about 9 feet at mean low tide.

The general dimensions of the harbor are, for the entrance channel 200 feet wide, 30 feet deep, 3,000 feet long; for the turning basin in front of the wharves 1,000 feet square by 30 feet deep. The entrance channel connects deep water in Bolivar Roads with the turning basin. The river and harbor act of March 2, 1907, appropriated $50,000 for obtaining a channel 150 feet wide and 25 feet deep, with increased width at wharf, from Galveston Harbor to Port Bolivar, see House Document No. 719, Fifty-ninth Congress, first session.

The contract was completed in October, 1908. A slip and wharf were constructed by the Gulf & Interstate Railway Co. and the port was opened for commerce June 14, 1909.

The river and harbor act of June 25, 1910, enlarged the project by increasing the dimensions of the channel to 30 feet deep, 200 feet wide, with a turning basin 1,000 feet square, at an estimated cost of $91,080, in accordance with the report submitted in House Document No. 328, Sixty-first Congress, second session. (With map.)

During the present fiscal year redredging was done by contractor's dredge and by the Government dredge *Gen. C. B. Comstock.*

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[1] Exclusive of amount available for fiscal year 1913.

Work on the 30-foot project began May 24, 1911, and the project was completed March 16, 1912. The channel was completed to the dimensions of 30 feet deep and 200 feet wide, with turning basin 1,000 feet square by 30 feet deep. Cost for the year $83,144.64, of which $15,195.58 was for maintenance.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, is $211,655.85, of which $74,586.15 was applied to maintenance of improvement.

The maximum draft that can be carried June 30, 1912, at mean low water, over the shoalest part of the locality, is 25.6 feet. The variation of water surface is 1½ feet.

The commercial statistics for the port are as follows:

Calendar year.	Short tons.	Value.
1911	231,702	$3,738,000
1910	180,666	6,964,581
1909	81,891	6,444,318
1908	50,000	5,578,705

Regarding the effect of the project upon freight rates, the principal article of commerce is lumber for export. The railroad rate from the mills to Port Bolivar has been from 1 cent to 3 cents per 100 pounds less than to Galveston; and the lumbermen report that they can effect a saving in handling charges of 35 cents per 1,000 feet b. m. over Galveston.

The amount required for expenditure in the fiscal year ending June 30, 1914, will be applied to the maintenance of the 30-foot channel.

July 1, 1911, balance unexpended		$107,978.68
Proceeds of sales of contact prints		.35
		107,979.03
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$88,358.95	
For maintenance of improvement	15,195.58	
		103,554.53
July 1, 1912, balance unexpended		4,424.50
Amount appropriated by river and harbor act approved July 25, 1912		25,000.00
Amount available for fiscal year ending June 30, 1913		29,424.50
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 50,000.00

(See Appendix T 4.)

5. *Houston Ship Channel, Tex.*—This improvement was formerly known as the Galveston Ship Channel and Buffalo Bayou, Tex.; the name was changed by the river and harbor act of June 25, 1910. The channel begins at deep water in Bolivar Roads, Galveston Harbor, and extends across Galveston Bay and through San Jacinto Bay and River and Buffalo Bayou to Houston, a total distance of 57 miles, of which 50 miles is the ship channel proper to the turning basin and the last 7 miles is a light-draft channel from the turning basin to Houston. The entire channel is tidal. In their natural

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[1] Exclusive of amount available for fiscal year 1913.

state these waterways had a depth of from 4 to 8½ feet at mean low tide, and were available only for light-draft boats.

The work of improving the waterway from deep water in Bolivar Roads to Houston was at first carried on under two different appropriations, one for ship channel in Galveston Bay and the other for Buffalo Bayou. The earlier projects for their improvement, adopted in 1871, 1877, 1881, and 1892, provided for a channel 100 feet wide and 12 feet deep. Dredging was carried on for a number of years, furnishing a channel sufficient for the character of vessels then navigating these channels.

In 1892 the Government purchased the Morgan Cut and Canal, 5.43 miles long, for $92,316.85.

In 1900 the two improvements were consolidated under one, Galveston ship channel and Buffalo Bayou.

In 1897 a report on a 25-foot depth was prepared, and appropriations for this depth began in 1900.

The amount expended on original project prior to operations under the 25-foot project was as follows:

Ship channel in Galveston Bay (including the purchase of Morgan Cut and Canal, $92,316.85)	$800, 328. 16
Buffalo Bayou, Tex	210, 137. 64
Total	1, 010, 465. 80

The existing project, adopted in 1899 (Annual Report of the Chief of Engineers for 1898, p. 1515, and H. Doc. No. 99, 55th Cong., 2d sess.), as modified in 1905 (Annual Report of the Chief of Engineers for 1905, p. 1495 et seq.), and Rivers and Harbors Committee Document No. 35, Sixty-first Congress, second session, is as follows:

For completing channel to head of Long Reach, including turning basin 600 feet in diameter, 25 feet deep, side slopes 1 on 2, division 1 (bay), 1 on 3 in divisions 2 and 3 (river), least radius 2,500 feet, 150 feet on bottom in division 1 (bay), 100 feet on bottom in divisions 2 and 3 (river)	$3, 170, 000
26,000 feet of dike revetment	40, 000
One hydraulic dredge	150, 000
Engineering and contingencies (about 10 per cent)	340, 000
Total	3, 700, 000
Amount available Dec. 1, 1904	150, 000
Balance required	3, 550, 000

The river and harbor act of June 25, 1910, placed the work under continuing-contract appropriations, the total authorization, including an appropriation of $300,000 made in the act, being $2,500,000, providing—

> That the sum of one million two hundred and fifty thousand dollars, being one-half of the amounts herein appropriated and authorized to be appropriated, shall be furnished for the work by the "Harris County Houston Ship Channel Navigation District," a local organization created and existing under and by virtue of the laws of the State of Texas; and no part of the appropriation herein made shall be available for expenditure, and no contract shall be entered into under the foregoing authorization, until the Secretary of War shall be satisfied that the said navigation district has made provision for furnishing the whole of said sum of one million two hundred and fifty thousand dollars, and has placed to his credit, and subject to his order in a United States depository to be designated by him, three hundred thousand dollars thereof, and has satisfied him that the remainder of said sum will be deposited, in like manner,

from time to time, as appropriations for the work may be made by Congress, and in amounts equal to those so appropriated: *Provided further*, That any contract entered into by the Secretary of War under the foregoing authorization shall specifically provide for the completion of the project, and that not more than one-half of the consideration agreed upon shall be furnished and paid by the United States.

The balance of the authorization remaining to be appropriated by the Government is $950,000.

In the election of January 11, 1911, "the Harris County Houston Ship Channel navigation district," Harris County, Tex., was authorized to issue bonds for $1,250,000.

Bonds have been issued and $300,000 deposited to the order of the Secretary of War.

During the year resurvey of the ship channel was begun preparatory to dredging under the new project. Contract for dredging under the above authority was entered into and work started, 38,648 cubic yards of material being removed before the end of the fiscal year. The cost for the year was $11,402.49, principally for surveying and laying out the work.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $2,224,910.34, of which $320,631.66 was for maintenance; the portion derived from miscellaneous sources, such as sales, etc., is $352.69.

The proportion of the approved project completed up to June 30, 1912, is about 50 per cent. The entire channel had been dredged to a depth of 18½ feet, but, owing to shoaling, the maximum draft that can be carried June 30, 1912, at mean low tide is, from Bolivar Channel to Red Fish, 9.7 feet; thence to Morgans Point, 9 feet; thence to the turning basin, 10 feet; thence to foot of Main Street, Houston, 6.5 feet.

The usual variation of level of water surface is, division 1 (bay division), lower bay, 1.3 feet; upper bay, 0.5 foot; and divisions 2 and 3 (river divisions), less than one-half foot. In times of flood rises of 12 or more feet occasionally occur in Buffalo Bayou.

The total length of the improved channel is 57 miles, 50 miles to the turning basin and 7 miles farther to Houston.

The amount and value of the commerce transported is as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
Calendar year—			Fiscal year—		
1911	1,354,897	$34,721,530	1904-5	106,135	$17,225,998
1910	1,371,650	39,155,357	1903-4	111,840	18,850,123
1909	1,214,904	36,097,560	1902-3	109,704	15,812,682
1908	602,734	28,318,621	1901-2	141,130	21,088,677
1907	452,463	24,466,730	1900-1901	154,459	19,630,640
1906	132,108	No value.			
1905	104,907	12,544,323			

The bulk of the tonnage is cotton, amounting last calendar year to 97,247 short tons, valued at $23,338,280, which is carried on barges to Galveston and there loaded on vessels.

The effect of this project on freight rates is unknown and is indeterminate because of a railroad rate differential in favor of Houston, authorized by the railroad commission of the State of Texas.

The amount required for expenditure in the fiscal year ending June 30, 1914, will be applied to forming the 25-foot channel.

July 1, 1911, balance unexpended	$352,804.17
Proceeds of sales of contact prints	21.95
	352,826.12
June 30, 1912, amount expended during fiscal year, for works of improvement	10,082.72
July 1, 1912, balance unexpended	342,743.40
July 1, 1912, outstanding liabilities	9,970.62
July 1, 1912, balance available	332,772.78
Amount of continuing contract authorization, act of June 25, 1910	1,250,000.00
Amount appropriated under such authorization	300,000.00
Amount yet to be appropriated	950,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 950,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 550,000.00

(See Appendix T 5.)

6. *West Galveston Bay Channel, Turtle Bayou, Trinity River, Anahuac Channel, Oyster Creek, Cedar, Chocolate, and Bastrop Bayous, Tex., including mouths of adjacent streams.*—This project has embraced the improvement of the following localites: West Galveston Bay, the Galveston and Brazos Canal, Hanna Reef (East Bay Bayou), Double Bayou, Anahuac Channel, mouth of Trinity River, Turtle Bayou, Cedar Bayou, Clear Creek, Dickinson Bayou, Chocolate Bayou, Bastrop Bayou, Oyster Creek. (Annual Report Chief of Enigneers, 1900, p. 2438 et seq.)

Prior to March 3, 1899, the improvement of West Galveston Bay and the Galveston and Brazos Canal, Double Bayou, mouth of Trinity River, and Cedar Bayou was independent. The river and harbor act of that date made an appropriation for the improvement of the Brazos River between Velasco and Richmond, West Galveston Bay Channel, Double Bayou, and the mouths of adjacent streams. The mouth of Trinity River and Cedar Bayou were transferred to this work, and Anahuac Channel was added by the act of March 3, 1905. Chocolate and Bastrop Bayous were added by the act of March 2, 1907, and Turtle Bayou and Oyster Creek by the act of June 25, 1910. As adjacent streams Hanna Reef (East Bay Bayou), Clear Creek, and Dickinson Bayou have been improved. Double Bayou has not been specially named in the act since 1905 and is now under improvement as an adjacent stream.

The Brazos River between Velasco and Richmond, which was included in the improvement for a time, is now covered by a separate appropriation.

As the West Galveston Bay Channel and Galveston and Brazos River Canal have been included in the "Inland waterway on the coast of Texas," and appropriated for under that heading, allotments for these works under this appropriation have ceased.

The object of this improvement, in part, is to obtain and maintain a navigable channel depth of from 4 to 6 feet across the bars at the mouths of the streams and bayous from deep water in the bay to deep water in the bayous.

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[1] Exclusive of the balance unexpended July 1, 1912, and to be furnished by local authorities.

The improvement is intended to develop a light-draft inland navigation which will afford cheap transportation by light-draft steamers and barges to the coast country of Texas.

The estimated cost of the modified project has been given in previous reports as $248,646.34, but, as works originally embraced in this project have been transferred to other appropriations and new works have been added for which no estimate of cost have been made, there is no estimated cost for the entire project. All the channels called for have been completed, but maintenance is regularly required.

The amount expended on these improvements under present project to June 30, 1912, has been as follows:

Channel across Hanna Reef	$3,299.67
Double Bayou	19,261.09
Anahuac Channel	15,556.10
Mouth of Trinity River	12,726.57
Turtle Bayou	8,899.97
Cedar Bayou	17,707.10
Clear Creek	27,480.16
Dickinson Bayou	20,724.35
Bastrop Bayou	17,730.29
Chocolate Bayou	12,143.89
Oyster Creek	6,942.24
Dredge *Gen. H. M. Robert*	67,992.51
Dredge *Capt. C. W. Howell*	15,000.00
Total	245,463.94

Of this amount $83,646.23 was applied to maintenance of improvement, and $116.43 has been derived from miscellaneous sources, such as sales, etc.

By authority of river and harbor act of March 3, 1899, a pipe-line hydraulic dredge was constructed for the improvement of these streams at a cost of $67,992.51. This dredge (*Gen. H. M. Robert*) was burned April 18, 1909, and the dredging has since been carried on by the dredge *Capt. C. W. Howell*. The latter, however, was lost at sea September 14, 1911, and there is now no plant available for light-draft work.

More and larger boats, especially power boats with schooner hulls, have been built to utilize the improvement. Most of the points reached are settlements not on railroads, and the improvements are of great importance to their commercial life.

The effect of these improvements has been generally to decrease freight rates to all points reached by the channels improved.

It is proposed to apply the amount required for expenditure in the fiscal year ending June 30, 1914, in dredging and snagging for maintenance of the channels now under improvement.

The river and harbor act approved July 25, 1912, made an appropriation of $25,000 for continuing improvement and for maintenance, including mouths of adjacent streams, but allotment to the various works has not yet been made.

(*a*) *Channel across Hanna Reef* (*East Bay Bayou*).—This is a channel across Hanna Reef, connecting lower Galveston Bay, East Bay, and East Bay Bayou, and is on the direct line of the inland waterway project. The natural depth was 2 feet at mean low tide.

Amount expended on work of existing project up to the close of the fiscal year ending June 30, 1912, was $3,299.67, of which $823.65 was applied to maintenance.

No work was done on this project during the fiscal year ending June 30, 1912.

By dredging across this reef vessels are allowed to proceed 16½ miles farther up East Bay to the mouth of East Bay Bayou.

Maximum draft that can be carried June 30, 1912, is about 5.5 feet at mean low tide.

Variation of water surface, about 1 foot.

For report of survey see House Document No. 451, Fifty-sixth Congress, first session (Report Chief of Engineers, 1900, p. 2379).

The commerce passing through this channel for the calendar year 1911 was 2,406 short tons, valued at $240,000.

(*b*) *Double Bayou.*—The navigation of this bayou was obstructed by a bar which prevented boats drawing over 2 feet of water entering the bayou.

The amount expended on work of existing project up to the close of the fiscal year ending June 30, 1912, was $19,261.09, of which $12,307.89 was applied to maintenance, exclusive of $2,711.40 deposited by private parties.

This expenditure has resulted in the excavation and partial maintenance of a channel 6,450 feet long, 60 to 80 feet wide, and from 5 to 7 feet deep across the bar and into the bayou.

No work was done during the fiscal year ending June 30, 1912.

Maximum draft that can be carried June 30, 1912, at mean low water is 2.7 feet.

The variation of water surface is about one-half foot.

This bayou within a half mile of its mouth divides into east and west branches, the east branch being navigable for 12 miles and west branch for 8 miles from mouth, making a total of 19½ miles.

For report on survey see House Document No. 387, Fifty-fifth Congress, second session (Report of the Chief of Engineers for 1898, p. 1512).

The commerce passing through this channel was for the calendar year 1911 6,007 short tons, valued at $218,150.

July 1, 1911, balance unexpended	$5,000
July 1, 1912, balance unexpended	5,000

(*c*) *Anahuac Channel.*—The original depth of this channel was about 3 feet.

Amount expended on work of existing project up to the close of the fiscal year ending June 30, 1912, was $15,556.10, of which $9,581 was for maintenance of channel.

The expenditure has resulted in the excavation and maintenance of a channel 16,013 feet long, 80 feet wide, and 7 feet deep from 6 feet of water in Trinity Bay to 8 feet of water in Browns Pass.

During the present fiscal year the redredging of the channel has been in progress, 6,600 feet having been gone over; redredging to depth of 6 to 8 feet and width of 50 feet, at an expenditure of $1,531.54.

Maximum draft that can be carried June 30, 1912, at mean low tide is 5.2 feet.

This channel is navigable for 3½ miles from the 6-foot contour in Galveston Bay to Anahuac.

Variation of water surface is about one-half foot.

For report on survey see House Document No. 440, Fifty-sixth Congress, first session (Report of the Chief of Engineers for 1900, p. 2342).

The commerce for the calendar year 1911 was 26,385 short tons, valued at $740,010. Rice, the main agricultural product, and lumber are the principal items. The channel is used by the United States mail boats, and as there is no railroad communication with the adjacent country all produce and supplies pass through this channel.

July 1, 1911, balance unexpended	$3,681.44
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,495.59
July 1, 1912, balance unexpended	2,185.85
July 1, 1912, outstanding liabilities	43.15
July 1, 1912, balance available	2,142.70

(*d*) *Mouth of Trinity River.*—This river empties into Galveston Bay through several mouths or passes, opposite each of which a bar existed on which the depth of water did not exceed 3½ feet at mean low tide.

Under earlier projects, adopted June 18, 1875, and amended May 4, 1889, dredging and snagging were done, the west jetty at Middle Pass completed to a length of 7,359 feet, and a channel 100 feet wide by 5 feet deep secured at a cost of $75,900. (See Report of the Chief of Engineers, 1889, p. 1557.) The channel subsequently shoaled to a ruling depth of 3½ feet, and at present Browns Pass leading to the Anahuac Channel is the one used and under improvement.

Amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $12,726.57, of which $9,086.13 was applied to maintenance.

Under present project a channel 80 feet wide and 6 feet deep has been dredged a distance of 1,800 feet.

Maximum draft that can be carried June 30, 1912, at mean low water, 6.2 feet.

Variation of water surface is about one-half foot.

During the calendar year 1911 commerce to the amount of 1,293 short tons, valued at $233,097, passed through this channel.

There was no work during the year.

July 1, 1911, balance unexpended	$2,000
July 1, 1912, balance unexpended	2,000

(*e*) *Turtle Bayou.*—Turtle Bayou empties into Turtle Bay, the head of Trinity Bay (part of Galveston Upper Bay). From Anahuac across Turtle Bay to the mouth of the bayou, 3½ miles, the channel had a depth of about 3 feet; the bar at the mouth had a depth of 2½ feet. Above this point the bayou has a depth of 16 feet for 5½ miles, 8 feet for 5 miles more, and 4 feet for 7 miles farther.

The present project, as adopted by the river and harbor act of June 25, 1910, calls for dredging a channel 4 feet deep and 50 feet wide from the mouth of Turtle Bayou across Turtle Bay to the foot of Browns Pass, near Anahuac, at a cost of $10,000.

Work began on this project February 14, 1911. The entire channel has been dredged by the Government dredge *Capt. C. W. Howell*, forming a channel 5 feet deep, 50 feet wide, and 15,895 feet long.

Amount expended on existing project to June 30, 1912, was $8,899.97, none of which was for maintenance.

No work was done on this project during the fiscal year ending June 30, 1912.

The maximum draft that could be carried June 30, 1912, was 4.1 feet. The stream is navigable to a point 17½ miles from the mouth.

The variation of water surface is about 1 foot.

Commerce passing through this channel was, for the calendar year 1911, 3,962 short tons, valued at $604,123.

For report on survey, see House Document No. 440, Fifty-sixth Congress, first session (Report Chief of Engineers, 1900, p. 2342).

July 1, 1911, balance unexpended	$1,100.03
July 1, 1912, balance unexpended	1,100.03

(*f*) *Cedar Bayou.*—Cedar Bayou discharges into the northwest corner of Galveston Upper Bay at a point about 1½ miles below the mouth of the San Jacinto River and distant 28½ miles from Galveston.

The original project for this improvement was adopted September 19, 1890, and consisted in deepening the channel over the bar by dredging so as to afford a depth of 5 feet at mean low tide, and protecting the dredged channel by brush and stone walls or jetties. The amount previously expended on this project was $32,150.

After crossing the bar a least depth of 9 feet can be carried up the bayou for a distance of 17 miles.

Under present project the jetties were repaired by filling the lowest places and gaps with riprap, and a channel 8 feet deep, 80 feet wide, and 8,690 feet long was dredged from the 8-foot depth inside the bayou across Cloppers Bar and connecting with the 8-foot depth in San Jacinto Bay.

During the past fiscal year no work was done.

Amount expended on existing project to close of fiscal year ending June 30, 1912, was $17,707.10, of which $10,769.95 was applied to maintenance.

Maximum draft that could be carried June 30, 1912, 4.3 feet. This stream is navigable to Needle Point, head of navigation, a distance of 20 miles from the mouth.

For report of survey, see Report of Chief of Engineers, 1890, page 1815.

The commerce passing through the channel was for the calendar year 1911, 21,436 short tons, valued at $778,151.

(*g*) *Clear Creek.*—Clear Creek empties into Galveston Upper Bay from the west. It was obstructed at its mouth by a narrow sand bar on which the depth did not exceed 2 feet. For a distance of 2 miles about the mouth the ruling depth is 8 feet. It then broadens into a lake 3 miles long and 1½ miles wide, having before improvement an average depth of 1½ feet. Above the lake the prevailing depth is from 8 to 12 feet.

Private parties have at various times dredged through the bar at the mouth into Galveston Bay, and during 1907–8 the U. S. dredge *Capt. C. W. Howell* dredged a channel 22,847 feet long, 40 feet wide, and from 4 to 6 feet deep.

Amount expended on existing project to close of fiscal year ending June 30, 1912, was $27,480.16, of which $13,189.21 was applied to maintenance. During the present fiscal year no work has been done.

The maximum draft that could be carried June 30, 1912, at mean low tide across the bar in Galveston Bay at the mouth of Clear Creek was 4.1 feet, and across Clear Creek 5.3 feet.

This stream is navigable to Friendswood, at the head of navigation, a distance of 20 miles.

For report of survey, see House Document No. 449, Fifty-sixth Congress, first session, with map (Report Chief of Engineers, 1900, p. 2385).

Variation of water surface is about one-half foot.

The commerce passing through the channel was for the calendar year 1911, 11,257 short tons, valued at $43,125.

(*h*) *Dickinson Bayou.*—Dickinson Bayou empties into Galveston lower bay about 20 miles northwest of the city of Galveston. Navigation was obstructed by a bar at its mouth with 2½ feet of water on its crest. After crossing the bar a depth of 10 feet can be carried up the bayou for 20 miles or more, and a depth of 6 feet for a distance of 25 miles from its mouth.

A channel from 6 to 6½ feet deep and about 60 feet wide over a distance of 19,100 feet through the shoal water of the bay and to deep water in the bayou had been dredged.

Amount expended on existing project to close of fiscal year ending June 30, 1912, was $20,724.35, of which $14,437.07 was applied to maintenance. During the present fiscal year no work has been done.

The maximum draft that can be carried June 30, 1912, at mean low tide over the bar is 4.2 feet.

This stream is navigable 10 miles from mouth to Galveston, Houston & Henderson Railway bridge for tugs and schooners. The same class of vessels could navigate to a point 25 miles from the mouth on removal of county and railway bridges.

For report of survey see House Document No. 448, Fifty-sixth Congress, first session, with map (Report of the Chief of Engineers for 1900, p. 2396).

Variation of water surface is 1 foot.

The commerce passing through this channel was, for the calendar year 1911, 4,783 short tons, valued at $16,650.

July 1, 1911, balance unexpended	$85.88
July 1, 1912, balance unexpended	85.88

(*i*) *Chocolate Bayou.*—Chocolate Bayou empties into Chocolate Bay, an arm of West Galveston Bay, about 12 miles north of San Luis Pass. At its mouth there is a bar with 3 feet of water on its crest. Above this bar the depth varies from 7 to 15 feet for 50 miles from its mouth.

Amount expended on work of existing project to close of fiscal year ending June 30, 1912, was $12,143.89, of which $5,631.67 was applied to maintenance.

A channel had been dredged 21,000 feet long from 5 feet of water in West Galveston Bay to 5 feet of water in Chocolate Bayou.

During the year some snagging has been in progress.

The maximum draft that can be carried June 30, 1912, at mean low tide over the shoalest part of the locality is 3 feet.

Variation of water surface, 1 foot.

This channel is used regularly by light-draft vessels a distance of 24 miles from its mouth to Liverpool. It is also navigable for 15 miles beyond Liverpool and navigation could be extended farther were it not for the overhanging trees along the banks, and snags.

For report of survey, see House Document No. 445, Fifty-sixth Congress, first session, with map (Report of the Chief of Engineers for 1900, p. 2403).

The commerce passing through this channel was, for the calendar year 1911, 7,515 short tons, valued at $55,315.

Allotted from appropriation made by river and harbor act of February 27, 1911	$3,500.00
June 30, 1912, amount expended during fiscal year, for works of improvement	17.60
July 1, 1912, balance unexpended	3,482.40
July 1, 1912, outstanding liabilities	1,135.80
July 1, 1912, balance available	2,346.60

(*j*) *Bastrop Bayou.*—Bastrop Bayou empties into Bastrop Bay, which is part of west Galveston Bay. The mouth of the bayou is 5 miles northwest of San Luis Pass and had a long shallow approach with only 10 inches of water on the bar. For 2 miles above the bar the water is shallow, averaging about 2 feet. Above that point there is, in general, a depth of 10 feet, but this depth was reduced by three shoals of a total length of about 3 miles with a depth of 2 feet. The stream can be navigated for a distance of 20 miles from its mouth.

A channel 400 feet long, 35 to 40 feet wide, and 4 feet deep was cut through the shell reef at the entrance to Bastrop Bay by the U. S. dredge and snag boat *Gen. S. M. Mansfield* in 1906 at a cost of $269.42, this amount being subscribed by interested parties.

During 1907 the U. S. dredge *Capt. C. W. Howell* cut a channel 18,765 feet long, 40 feet wide, and 4 to 5 feet deep up the bayou beyond three small shoals obstructing navigation.

Amount expended on work of existing project to close of fiscal year ended June 30, 1912, was $17,730.29, of which about $7,810.07 was for maintenance.

During the year there was no work and no expenditure.

The maximum draft that could be carried June 30, 1912, at mean low tide over the shoalest part of the locality was 2.6 feet.

Variation of water surface, 1 foot.

For report of survey see House Document No. 454, Fifty-sixth Congress, first session, with map. (Report Chief of Engineers, 1900, p. 2414.)

The commerce passing through this channel was for the calendar year 1911, 1,369 short tons, valued at $41,650.

(*k*) *Oyster Creek.*—Oyster Creek empties into the Galveston and Brazos Canal about 3 miles above the terminus of the canal at the Brazos River. For a distance of 2 miles above the junction with the canal the creek has a depth of less than 4 feet. Above that point it is navigable for boats with 4-foot draft for over 15 miles.

The present project, as adopted by the river and harbor act of June 25, 1910, calls for dredging in the creek to obtain a 4-foot channel. There has been no estimate of cost.

Work began on this project April 19, 1911, and to the close of the fiscal year ending June 30, 1912, the amount expended has been $6,942.24, none of which was for maintenance.

No work has been done during the past fiscal year; the amount expended was for surveys.

The maximum draft that can be carried June 30, 1912, over the dredged portion is 1½ feet. In the creek above there is a ruling depth of 3.7 feet. The stream is navigable to a point 5 miles above its mouth, where it is obstructed by a railway bridge.

The variation of water surface is 1 foot.

As far as known there is no commerce carried over this stream.

For report of survey, see House Document No. 447, Fifty-sixth Congress, first session, with map (Report of Chief of Engineers, 1900, p. 2418).

July 1, 1911, balance unexpended	$1,105.98
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	27.10
July 1, 1912, balance unexpended	1,078.88
July 1, 1912, outstanding liabilities	39.08
July 1, 1912, balance available	1,039.80

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July 1, 1911, balance unexpended		$29,398.33
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$17.60	
For maintenance of improvement	1,522.69	1,540.29
July 1, 1912, balance unexpended		27,858.04
July 1, 1912, outstanding liabilities		1,218.03
July 1, 1912, balance available		26,640.01
Amount appropriated by river and harbor act approved July 25, 1912		25,000.00
Amount available for fiscal year ending June 30, 1913		51,640.01
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1]25,000.00

(*l*) *Channel in West Galveston Bay.*—See "Inland waterway on the coast of Texas."

(*m*) *Galveston and Brazos River Canal.*—See "Inland waterway on the coast of Texas."

(See Appendix T 6.)

7. *Inland waterway on the coast of Texas.*—The river and harbor act of March 2, 1907, appropriated $133,829, and authorized the Secretary of War to enter into contract for materials and work to the extent of $300,000, all of which has since been appropriated.

In addition, $192,000 has been appropriated for maintenance.

This project embraces the improvement of the following localities: West Galveston Bay and Brazos River Canal; channel from Aransas Pass to Pass Cavallo, including the Guadalupe River to Victoria; Turtle Cove Channel from Aransas Pass to Corpus Christi, Tex.

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[1] Exclusive of amount available for fiscal year 1913.

The river and harbor act of June 25, 1910, appropriated $200,000 toward the construction of the section of the waterway between Brazos River and Matagorda Bay, in accordance with the report printed in Rivers and Harbors Committee Document No. 3, Sixty-first Congress, second session. The estimated cost of the entire section, 5 feet depth and 40 feet width, is $400,000. With the completion of this section the entire waterway between Galveston and Corpus Christi, a distance of 200 miles, will be opened up.

The object of the improvement is to obtain and maintain a navigable channel depth of 5 feet in a canal along the coast of Texas, utilizing the lagoons lying between the islands and the mainland. The improvement will develop a light-draft inland navigation which will afford cheap transportation by light-draft steamers and barges to the coast country of Texas.

The amount expended under this appropriation to June 30, 1912, has been as follows:

West Galveston Bay and Brazos River Canal	$175,419.93
Channel between Brazos River and Matagorda Bay	77,880.88
Aransas Pass to Pass Cavallo	72,597.54
Guadalupe River	182,495.60
Turtle Cove Channel	126,723.57
Total	635,117.52

Of this amount $78,628.42 has been for maintenance and $2,298.02 has been derived from miscellaneous sources, such as sales, etc.

The projected channels have been obtained, except the river channel from Victoria to the mouth of the Guadalupe River and the channel between Brazos River and Matagorda Bay.

More and larger boats with auxiliary gas engines have been built to utilize the improvement. Most of the points to be reached are settlements which railways can not afford to develop, and the improvements are of great importance to their commercial life.

The effect of the project on freight rates is shown by one instance—from Galveston to the plantations on the lower end of the Guadalupe. The rate by rail to the nearest point and by boat to the river landing is 63½ cents per 100 pounds on general merchandise; the all-water route rate is 35 cents. The combined cotton rate is $2.90 per bale and the all-water rate $1 per bale.

(*a*) *West Galveston Bay and Brazos River Canal.*—Previous to 1908 these channels were carried under another appropriation, viz, "West Galveston Bay Channel, Tex., and mouths of adjacent streams, etc."

West Galveston Bay.—This is a body of water covering about 39 square miles and lies between Galveston Island and the mainland. It extends from Galveston Bay to the west end of Oyster Bay and is connected with the Gulf of Mexico by San Luis Pass at the western extremity of Galveston Island and with the Brazos River by the Galveston and Brazos River Canal. The minimum depth of the bay was from 2½ to 3 feet.

The former project, adopted July 13, 1892, and modified in 1896, contemplated a least depth of 5 feet, at an estimated cost of $28,998.80.

The work done resulted in a channel 100 feet wide and 3 to 3½ feet deep from Galveston Bay to the Galveston and Brazos River Canal. Beacons were also erected to define the channel. The channel subsequently shoaled to 18 inches in places.

Amount expended, including maintenance to close of the fiscal year ending June 30, 1907, was $35,059.69.

Galveston and Brazos River Canal.—This canal was originally dredged by the Galveston & Brazos Navigation Co. The original cut was 10 miles long (made in 1851–1853), 100 feet wide at bottom, and 6 feet deep. Steamboats from 145 to 175 feet long and from 28 to 30 feet wide used the canal, carrying from 550 to 1,200 bales of cotton.

The United States purchased the canal in December, 1902, at a cost of $30,000. The canal when acquired by the United States was badly obstructed with snags, drift, and silt.

Previous to June 30, 1907, the canal had been dredged for practically its entire length to a depth of 3 feet at mean low tide and width of from 35 to 40 feet. The bank had been reenforced at various points by brush.

The amount expended by the United States on the canal up to the close of the fiscal year ending June 30, 1907, was $67,307.66, of which $30,000 was for purchase of canal and $3,203.97 was applied to maintenance.

The existing project, combining this channel and West Galveston Bay Channel under one appropriation, was adopted by the river and harbor act of March 2, 1907, and provides for a channel 40 feet wide and 5 feet deep, at an estimated cost of $151,529 and $20,000 annually for maintenance.

For report of examination upon which this project is based, see House Document No. 640, Fifty-ninth Congress, second session, with map.

The amount expended on existing project to close of fiscal year ending June 30, 1912, was $175,419.93, of which $40,928.39 was for maintenance of the improvement. Of this amount $2,283.62 was derived from miscellaneous sources, such as sales, etc.

There was no work during the year. The expenditure of $208.74 was for surveys, office expenses, etc., and was applied to maintenance.

The project has been completed in that the projected depths have been attained, but maintenance is regularly required, and the additional appropriation recommended will be applied to this purpose.

The variation of water surface is about 1 foot, except at times of Brazos River overflows and northers. The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality is 2.8 feet. The length of the channel is 36 miles—21 miles in West Galveston Bay and 15 miles thence to the Brazos River.

No commercial statistics could be obtained for the calendar year 1911. The channel is used by small fishing and vegetable boats, from which no statistics could be obtained.

From records kept by the Gulf, Colorado & Santa Fe Railway Co. of vessels passing through the draw of its bridge across West Galveston Bay during the calendar year 1911, 4,903 vessels used the waters of West Galveston Bay.

This work has had no appreciable effect on freight rates.

July 1, 1911, balance unexpended	$17,641.26
Proceeds of sales of contact prints	3.65
	17,644.91
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	208.74

July 1, 1912, balance unexpended	$17,436.17
July 1, 1912, outstanding liabilities	2.52
July 1, 1912, balance available	17,433.65
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	10,000.00
Amount available for fiscal year ending June 30, 1913	27,433.65
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 10,000.00

(*b*) *Channel between Brazos River and Matagorda Bay.*—This section of the waterway extends from the Brazos River, at the termination of the Galveston and Brazos River Canal, to 5 feet of water in Matagorda Bay, a distance of 32 miles. The line lies parallel to the coast line of the Gulf of Mexico, distance therefrom half a mile to a mile and a half. The land along the route is generally marshy with numerous shallow bayous, lakes, and ponds, and the elevations along the line do not exceed 5 feet above mean low tide. Of the total length of 32 miles, 24½ miles are overland.

The project as adopted by the river and harbor act of June 25, 1910, contemplates a channel 5 feet deep and 40 feet wide, at a cost of $400,000, with $15,000 annually for maintenance.

Work began on this project May 9, 1911, and to the close of the fiscal year ending June 30, 1912, the amount expended had been $77,880.88, none of which was for maintenance. The work consisted of dredging by contract to form the adopted channel, and by the end of the year 2,200 feet of the channel had been formed, starting at the Brazos River, and 13½ miles completed starting at the Matagorda end.

There is as yet no navigation and no commerce. The project has had no effect on freight rates.

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the improvement.

Report of examination on which the project is based is printed in Rivers and Harbors Committee Document No. 3, Sixty-first Congress, second session.

Of the appropriation of $62,000 made by the river and harbor act approved July 25, 1912, $50,000 will be used for continuing work by dredging under existing contract, and $12,000 for the construction of highway bridges at points where the waterway will intersect existing county roads, as directed by the above-mentioned act.

July 1, 1911, balance unexpended	$199,322.40
June 30, 1912, amount expended during fiscal year, for works of improvement	77,195.13
July 1, 1912, balance unexpended	122,127 27
July 1, 1912, outstanding liabilities	19,711.22
July 1, 1912, balance available	102,416.05
Amount appropriated by river and harbor act approved July 25, 1912	62,000.00
Amount available for fiscal year ending June 30, 1913	164.416.05
July 1, 1912, amount covered by uncompleted contract	128,406.25
Amount (estimated) required to be appropriated for completion of existing project	[1] 50,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 25,000.00

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[1] Exclusive of amount available for fiscal year 1913.

(*c*) *Channel from Aransas Pass to Pass Cavallo.*—This channel was originally developed by the State of Texas and private parties and was the old United States mail route between Indianola and Corpus Christi. In 1875 vessels drawing not over 3 feet could navigate the channel.

The project, as adopted by the river and harbor act of March 2, 1907, contemplates a depth of 5 feet, 40 feet wide, from the entrance at Aransas Pass to Matagorda Bay, a distance of about 63 miles, at a cost of $65,850.

The river and harbor act approved July 25, 1912, contains a provision authorizing the Secretary of War to change the route of the channel from Aransas Pass to Pass Cavallo so as to pass by the town of Port O'Connor, Tex., and to expend available funds for this work, instead of maintaining the channel along its present route.

Amount expended on existing project to close of fiscal year ending June 30, 1912, $72,597.54, of which $23,579.78 was for maintenance.

During the present fiscal year the redredging of the channel has been in progress, 8,000 feet having been gone over, redredging to depth of 5 feet and width of 40 feet, at an expenditure of $13,107.66, all of which was for maintenance.

The maximum draft that can be carried at mean low tide over the shoalest part of the route is 3 feet.

Variation of water surface, about three-fourths of a foot.

Commercial statistics for the calendar year shows a tonnage (in short tons) of 1,497, valued at $38,813. The improvement has had no effect upon freight rates.

Report of examination is printed in House Document No. 336, Fifty-ninth Congress, second session, with map. House Document No. 640, same session, shows a reduction in the estimated cost.

July 1, 1911, balance unexpended	$46,361.07
Proceeds of sales of contact prints	.50
	46,361.57
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	13,107.66
July 1, 1912, balance unexpended	33,253.91
July 1, 1912, outstanding liabilities	25.00
July 1, 1912, balance available	33,228.91

(*d*) *Guadalupe River, bay section.*—This channel connects the mouth of the Guadalupe River with the channel from Aransas Pass to Pass Cavallo. For the first 8 miles there was originally 6 feet of water, shoaling to 4 feet at the twelfth mile, then through a flat with about 2 feet to the mouth of the river at the sixteenth mile.

Variation of water surface, about three-fourths of a foot.

The project contemplates a navigable waterway 5 feet deep and 40 feet wide at a cost of $30,000, and was completed in July, 1909, at a cost of $29,153.82.

During the year the channel was redredged by Government plant for a distance of 35,800 feet.

River section to Victoria, Tex.—The Guadalupe River empties into San Antonio Bay, 16 miles from the inland waterway on the coast of Texas. Its width varies from 90 feet at main entrance at mouth, increasing to 140 feet, 52 miles above its mouth. The depth varies from less than 3 feet over shoals to 20 feet at bends.

Before improvement thick overhanging trees, numerous, snags, and sunken logs, together with rafts, were found in the river.

The river was formerly navigated to Victoria, 52 miles from its mouth, but owing to rafts navigation has been abandoned in recent years.

The project contemplates the removal of rafts, snags, etc., and the dredging of shoals to 5 feet, at a cost of $62,700.

During the year snagging and bank trimming has been carried on by Government plant; the river has been cleared for a length of 11¾ miles above its mouth, and from mile 14½ to mile 29⅞.

The amount expended on the work of existing project up to the close of the fiscal year June 30, 1912, including both bay and river sections, is $182,495.60, of which $9,948.32 was for maintenance. All the money called for by the original project ($92,700 and $140,000 additional) has been appropriated. The increased cost of the work is due to an underestimate of the amount of dredging necessary in the river section and to the construction of a combination dredge and snagboat *Guadalupe*, at a cost of $40,000.

The work thus far accomplished has been the widening of the river for a distance of 11¾ miles from its mouth by the removal of thick overhanging trees; the maintenance of the channel from the mouth to the San Antonio River; snagging and bank-trimming between miles 14½ and 29⅞, and from the San Antonio River to mile 11¾. Cotton and other freight is shipped from plantations at the lower end and in the upper end sugar cane and wood have been taken to Victoria. There is no commerce in the middle portion.

The commerce for the calendar year 1911 amounted to 5,694 short tons, valued at $316,310. The project has had no effect on freight rates.

The work of clearing the river of snags and overhanging trees is about 85 per cent completed.

It is intended to apply the amount recommended for expenditure during the fiscal year ending June 30, 1914, toward completing the improvement and resnagging the channel from mile 29⅞ to Victoria.

Report of examination and survey is printed in House Document No. 336, Fifty-ninth Congress, second session.

July 1, 1911, balance unexpended		$44,893.58
Sales of condemned property		20.00
		44,913.58
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$24,740.31	
For maintenance of improvement	9,948.32	
		34,688.63
July 1, 1912, balance unexpended		10,224.95
July 1, 1912, outstanding liabilities		3,958.54
July 1, 1912, balance available		6,266.41
Amount appropriated by river and harbor act, approved July 25, 1912		40,000.00
Amount available for fiscal year ending June 30, 1913		46,266.41
Amount that can be profitably expended in fiscal year, ending June 30, 1914, for works of improvement and for maintenance		[1] 15,000.00

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[1] Exclusive of amount available for fiscal year 1913.

(*e*) *Turtle Cove Channel between Aransas Pass and Corpus Christi.*—This is a natural depression between Harbor and Mustang Islands connecting at high tide the waters of Aransas and Corpus Christi Bays. It is about 13,500 feet long and 2,000 feet wide, with approximate depth of 1½ feet below mean low tide.

Variation of water surface is about 1 foot.

The project adopted by river and harbor act of March 2, 1907, contemplated a channel 8½ feet deep at mean low tide and 75 feet wide at the bottom, at a cost of $123,750, and was completed in fiscal year 1909 and redredged during fiscal year 1911.

The river and harbor act of June 25, 1910, extended the project to the obtaining of a 12-foot channel between Aransas Pass and Corpus Christi for $157,900, according to report in House Document No. 678, Sixty-first Congress, second session. Report on this new project will be found on page 722 of this report.

Amount expended on existing project to close of fiscal year, ending June 30, 1912, was $126,723.57, of which $4,171.43 was for maintenance. No expenditures were made during the past year.

The ruling depth through the channel on June 30, 1912, was 9.9 feet.

The variation of water surface is about 1 foot.

The amount of commerce carried through the channel is the same carried through Aransas Pass Channel (see p. 720 of this report), 8,880 short tons, valued at $863,000.

For reports of surveys, see House Documents No. 338, Fifty-ninth Congress, second session, and No. 678, Sixty-first Congress, second session.

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July 1, 1911, balance unexpended		$308, 218. 31
Proceeds of sales		24. 15
		308, 242. 46
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$101, 935. 44	
For maintenance of improvement	23, 264. 72	
		125, 200. 16
July 1, 1912, balance unexpended		183, 042. 30
July 1, 1912, outstanding liabilities		23, 697. 28
July 1, 1912, balance available		159, 345. 02
Amount appropriated by river and harbor act, approved July 25, 1912		112, 000. 00
Amount available for fiscal year, ending June 30, 1913		271, 345. 02
July 1, 1912, amount covered by uncompleted contracts		128, 406. 25
Amount (estimated) required to be appropriated for completion of existing project		[1] 88, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 50, 000. 00

(See Appendix T 7.)

8. *Operating and care of West Galveston Bay and Brazos River Canal, Tex.*—A boom tender was stationed during the year to tend the boom at the entrance to the canal into the Brazos River.

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[1] Exclusive of amount available for fiscal year 1913.

The total amount expended for this purpose to June 30, 1912, is $4,397.67.

July 1, 1911, balance unexpended	$120
Amount allotted June 12, 1912	120
	240
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	110
July 1, 1912, balance unexpended	130
July 1, 1912, outstanding liabilities	10
July 1, 1912, balance available	120

(See Appendix T 8.)

9. *Mouth of Brazos River, Tex.*—The Brazos River rises in the northwest portion of Texas, flows in a southerly direction for about 950 miles, emptying into the Gulf of Mexico 50 miles west of the Galveston entrance and 141 miles east of Aransas Pass.

The mouth of the river was originally obstructed by a shifting bar, about three-eighths of a mile from shore, the channel affording variable depths of water for navigation—of not over 8 feet at mean low tide and sometimes as shoal as 3 feet—being subject to changes due to winds and tides.

The present improvement includes a section of the river of about 6½ miles.

The original project was adopted in 1880 for the improvement of the channel over the bar by the use of jetties. The work was suspended in 1889. The amount expended on original project prior to operations under existing project was $142,098.43, and an additional sum of $5,000 for a board of engineers to ascertain character and value of improvements made by the Brazos River Channel & Dock Co.

After suspension of work by the United States the improvement of the mouth of this river was undertaken by the Brazos River Channel & Dock Co., which constructed two parallel jetties 560 feet apart. The northeast jetty was extended 4,708 feet long and the southwest 5,018 feet. In 1899 this company complied with the conditions of an act of Congress requiring a transfer to the United States of the jetties and auxiliary works; also a release of all rights and privileges conferred upon said company by its charter or by the act of Congress approved August 9, 1888, to charge or collect tolls for the use and navigation of said river.

For report of the board of engineers on character and value of the improvements made by the company, see Report of the Chief of Engineers, 1897, page 1815.

The existing project, approved July 11, 1899, was to repair and strengthen the jetties, construct spur dikes and bank protection, and to dredge a channel 18 feet deep and 150 feet wide. The estimated cost, $250,000, was increased by $175,000 after the hurricane of September 8, 1900. The project is completed. Dredging will always be necessary to maintain the channel.

As the result of an examination authorized by the river and harbor act approved March 2, 1907, the Board of Engineers for Rivers and Harbors arrived at the conclusion that for the present no further improvements should be made at the mouth of the Brazos River and that work under the existing project should be confined to the maintenance of the jetties, and this opinion was concurred in by the Chief of Engineers. (See H. Doc. No. 1087, 60th Cong., 2d sess., with map.)

The river and harbor act of February 27, 1911, appropriated $100,000 for dredging and repairs to the jetties. This money and the available balance was applied to procure an 18-foot channel to the railroad wharf; also to repairing the northeast jetty, the contract for which is not yet completed.

During the year a channel 18 feet deep and 150 feet wide was excavated up to the railroad wharf, a distance of about 2½ miles, under contract with the Bowers Southern Dredging Co., of Galveston, Tex., at a cost of $87,849.07.

Under contract with Chas. Clarke & Co., of Galveston, Tex., work on repairs to northeast jetty was begun, and at the end of the year 50 per cent completed, at an expense of $12,651.85.

The amount expended on the work of existing project up to close of fiscal year ending June 30, 1912, was $405,631.87, of which $13,557.86 was applied to maintenance. The portion derived from miscellaneous sources, such as sales, etc., is $11.92.

The latest information shows a minimum depth on the bar, beyond the jetties, of 18 feet at mean low tide, and from the outer end of the jetties to the wharf of 13½ feet. The length of the improved section is 6½ miles. Mean range of tide, 1.77 feet.

The present head of low-water navigation on the river is at Bolivar Landing 40 miles above the mouth. On a small rise the river can be navigated to Richmond, a distance of 99 miles.

During the year steamers of the Seaboard and Gulf Steamship Co. used the channel, and during the calendar year 1911 carried through the channel 3,063 short tons valued at $759,678.

This improvement has had some effect on ocean freight rates on competing lines to Galveston.

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the project.

July 1, 1911, balance unexpended		$115,339.16
Proceeds of sales of contact prints		1.60
		115,340.76
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$84,157.29	
For maintenance of improvement	12,651.85	
		96,809.14
July 1, 1912, balance unexpended		18,531.62
July 1, 1912, outstanding liabilities		3,720.52
July 1, 1912, balance available		14,811.10
Amount appropriated by river and harbor act approved July 25, 1912		25,000.00
Amount available for fiscal year ending June 30, 1913		39,811.10
July 1, 1912, amount covered by uncompleted contracts		8,689.31
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 25,000.00

(See Appendix T 9.)

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[1] Exclusive of amount available for fiscal year 1913.

10. Brazos River, Tex., from Velasco to Old Washington.—This section of the river has a width of from 200 to 400 feet. It has good depth from the mouth to near the head of tide water above Columbia (mile 36) and about a 4-foot navigable channel above that point to about mile 50.

The river has a very small low-water discharge. The flood discharge, though small, can not be carried in the channel, and the banks are overflowed during all large floods. The high banks erode readily, consequently the navigable channel is unstable, and open-river improvement difficult and expensive. A navigable channel of 4 feet exists only when the river is at a stage of about 4 feet, or possibly four months per year in intermittent periods.

The original project for this improvement was adopted June 3, 1896, and contemplated the removal of snags and overhanging trees and dredging troublesome shoals between Velasco and Richmond only. The sum of $5,000 was expended on this project.

In the river and harbor act of June 13, 1902, the improvement from Richmond to Old Washington was undertaken. In the act of March 3, 1905, this improvement was continued from Velasco to Old Washington. The project on which these appropriations were based (see Report of the Chief of Engineers, 1901, p. 1974) contemplated the improvement of the river by open-channel work between the mouth and Old Washington, at a cost of $225,000.

Amount expended on work of existing project up to June 30, 1912, was $325,251.24.

No advantage has been taken of the improvement above Columbia, principally on account of the fact that the characteristics of flow of the river are such that the periods during which the river can be navigated are indefinite as to time and duration.

The operations during the year consisted in the removing of obstructions by snagging and the cutting of trees on banks between mile 83 and mile 115. No work was done in the nature of jetty construction or repairs, and the work of that nature that has been done has either been obliterated or is of no further use.

Over this section of the Brazos River the depth is such that navigation can take place during a 6-foot stage of the river by boats having considerable power. No commerce of any note has developed nor can any be expected until the Brazos River is improved from its mouth up to Waco, or until the territory about the lower portion is given over more to agriculture than it is now.

An estimate of $25,000 is submitted as the amount required in addition to funds already available to operate the plant on hand for open-channel work so as to facilitate all traffic allowed by the natural channel depths and to prevent deterioration of present plant and channel.

The distances of the various places mentioned in the above report from the mouth of the river are as follows: Velasco, 5 miles; Columbia, 35 miles; Richmond, 99 miles; Old Washington, 254 miles; Navasota Lock, 259 miles; Waco, 424 miles.

The improvement has so far caused no effect on freight rates and no effect is looked for until the river is improved throughout.

For reference to reports of examinations and surveys, see Annual Report of the Chief of Engineers for 1907, page 453.

July 1, 1911, balance unexpended	$60,388.70
Proceeds of sales of property	185.81
	60,574.51
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	25,594.96
July 1, 1912, balance unexpended	34,979.55
July 1, 1912, outstanding liabilities	1,674.69
July 1, 1912, balance available	33,304.86
Amount appropriated by river and harbor act approved July 25, 1912	15,000.00
Amount available for fiscal year ending June 30, 1913	48,304.86
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 25,000.00

(See Appendix T 10.)

11. Brazos River, Tex., from Old Washington to Waco.—The Brazos River rises in the plains of northwest Texas, flows southeasterly through the east central portion of Texas, and empties directly into the Gulf of Mexico at a point 45 miles southwest of Galveston Harbor. Its total length is about 950 miles. That portion of the river included under this project extends from Old Washington 254 miles above the mouth to Waco, 424 miles above the mouth, and is, therefore, 170 miles long. The profile of this section of river shows an alternating series of steep and gentle slopes, not navigable above Hidalgo Falls, 260 miles above the mouth of the river. The river has ordinarily such a small discharge that open-river navigation is impracticable.

In the river and harbor act of March 3, 1905, an examination of this section was ordered and a provisional appropriation for its improvement was made. In the act of March 2, 1907, a further appropriation was made, in accordance with a project submitted in a report published in House Document No. 705, Fifty-ninth Congress, first session. This project contemplates securing a navigable depth of 4 feet for four months and 3½ feet for six months of the year by constructing eight locks and dams and 103 miles of open-channel work, at a total cost of $2,915,000, the first lock and dam of the series being located at Hidalgo Falls.

The river and harbor act of March 2, 1907, authorized continuing contracts in the sum of $150,000, in addition to amounts already appropriated for the completion of the lock and dam at Hidalgo Falls, which amount has been appropriated.

From the amount of money appropriated by river and harbor act of March 3, 1909, the sum of $75,000 was allotted. This allotment was required in addition to the $300,000 to repair flood damages and to construct bank protection to prevent further erosion at the site of the lock.

The river and harbor act approved June 25, 1910, contains an item of $75,000 for the construction of Lock and Dam No. 8, about 7 miles below Waco, and the act of February 27, 1911, contained an appropriation of $50,000 for completion of the lock and dam at Hidalgo

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[1] Exclusive of amount available for fiscal year 1913.

Falls; and the act of July 25, 1912, appropriated $200,000 for Lock and Dam No. 8 and two additional locks and dams.

No reduction in the freight rates in the territory tributary to this stretch of the river can be expected until this portion, as well as that below Old Washington to about mile 55, is full improved.

To June 30, 1912, there has been expended on the present project $429,660.16, of which $58,359.27 was expended during the fiscal year 1912.

Delivery of the iron and steel to be used in the dam at Hidalgo Falls was completed during the month of October, 1910.

Contract was made November 18, 1911, for furnishing iron and steel for the lock, including gates, valves, operating mechanism, etc., and delivery was made during March, 1912.

All this iron and steel is now stored on the reservation, except such parts as it was necessary to build into the lock and dam in course of construction. It has been decided not to install the movable parts of this lock and dam at present, but to keep them in storage until such time as the project shall have been sufficiently completed to warrant affording navigation over Hidalgo Falls. This prevents the rapid deterioration and high cost of maintenance that would occur if all parts were installed before actually needed.

During the past fiscal year work was resumed November 17, 1911, and has comprised continuation of work on the weir and drift chute, the construction of a lock-tender's dwelling, the receipt of all iron and steel for lock, a survey of the lock site, etc. The total expenditures for the year on Lock and Dam No. 1 have been $22,029.09. The construction of this lock and dam is 90 per cent completed.

Work began on Lock and Dam No. 8 near Waco in December, 1911, and has consisted of construction of temporary quarters for workmen, the construction of a lock-tender's dwelling, the construction of a railway spur 2.8 miles long for the delivery of material, the purchase and assembling of plant, the purchase of miscellaneous material, the beginning of construction of a cofferdam for the lock, and the driving of foundation piles, all at a total cost to June 30, 1912, of $42,226.70.

This lock and dam is about 25 per cent completed.

For reference to reports of examinations and surveys, see Annual Report of the Chief of Engineers for 1907, page 452.

The river and harbor act of March 3, 1909, directed an examination of the Brazos River, with a view to the selection of sites for additional locks and dams between Old Washington and Waco. This examination has been made and the sites selected, report on which has been transmitted to Congress and printed in House Document No. 95, Sixty-second Congress, first session.

In his annual report for the fiscal year 1910 the Chief of Engineers expressed the opinion that in view of the large increase in cost of construction work and other changed conditions since this improvement was undertaken, the project should be reexamined with a view to revision. Since such a reexamination as was suggested has not been provided for in subsequent river and harbor acts enacted by Congress, and since appropriations have been made in such acts for lock and dam construction, it is assumed that it is the intention of Congress to continue the improvement by the construction of locks and dams.

July 1, 1911, balance unexpended	$128,756.79
Proceeds of sales of property	328.00
	129,084.79
June 30, 1912, amount expended during fiscal year, for works of improvement	58,359.27
July 1, 1912, balance unexpended	70,725.52
July 1, 1912, outstanding liabilities	32,786.85
July 1, 1912, balance available	37,938.67
Amount appropriated by river and harbor act approved July 25, 1912	200,000.00
Amount available for fiscal year ending June 30, 1913	237,938.67
Amount (estimated) required to be appropriated for completion of existing project	[1] (Indefinite.)
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 200,000.00

(See Appendix T 11.)

12. Channel from Pass Cavallo to Port Lavaca, Tex.—The bar at Pass Cavallo is 125 miles from the Galveston Bar and 54 miles from the Aransas Pass Bar. Port Lavaca lies 26 miles to the northward of the pass across Matagorda and Lavaca Bays. The depth of water in the bays is over 7 feet, but across two reefs over which the channel passes the depth was reduced to about 6 feet.

The present project, adopted by the river and harbor act of June 25, 1910, according to House Document No. 1082, Sixtieth Congress, second session, with maps, provides for a channel 7 feet deep and 80 feet wide to Port Lavaca, at an estimated cost of $10,000, with an increased annual expenditure for maintenance of $2,500.

Work begun on this project November 4, 1910, and was completed December 11, 1910, the required channel having been obtained by dredging. Up to the close of the fiscal year ending June 30, 1912, the amount expended was $9,699.48, none of which was for maintenance. The project is completed.

The maximum draft that can be carried June 30, 1912, at mean low water over the shoalest part of the locality, is 7 feet. The variation of water surface is about 1 foot.

The tonnage carried through the channel during the calendar year 1911 amounted to 734 short tons, valued at $25,025. The improvement has had no known effect upon freight rates.

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the project.

July 1, 1911, balance unexpended	$300.52
July 1, 1912, balance unexpended	300.52
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2] 5,000.00

(See Appendix T 12.)

13. Aransas Pass, Tex.—Aransas Pass is on the south coast of Texas, 188 miles southwest of Galveston and 125 miles north of the Rio Grande, and is the outlet of Aransas Bay into the Gulf of Mexico. The area of the bay is about 80 square miles. It is connected with

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[1] Exclusive of amount available for fiscal year 1913.

[2] Exclusive of the balance unexpended July 1, 1912.

Corpus Christi Bay on one side and with the Mesquite, St. Charles, and Copano Bays on the other.

The depth over Aransas Bar has varied greatly—from 9 feet in 1852, 9½ feet in 1871, 7 feet in 1875, to 8½ feet in 1887.

For projects and work done by the United States Government and private corporations at Aransas Pass, see Annual Report of the Chief of Engineers for 1898, page 1527 et seq.

Amount expended on the original and the modified Government project prior to operations under the Aransas Pass Harbor Co.'s project was $540,477.65, exclusive of $9,938.93 subscribed by the citizens of Rockport and Corpus Christi, Tex., and $5,000 appropriated for Board of Engineers to ascertain character and value of improvements of Aransas Pass Harbor Co.

The last appropriation had been expended in accordance with the project prepared by Maj. O. H. Ernst, Corps of Engineers, in 1887 (printed on pp. 1313 to 1315 of the Annual Report of the Chief of Engineers for 1888). This project called for two parallel jetties and the revetment of Mustang Island.

Under the provisions of the river and harbor act of March 3, 1899, the Aransas Pass Harbor Co., under date of March 27, 1899, released and surrendered all rights and privileges theretofore granted to it by Congress, including the jetty constructed at the entrance of the pass.

The United States Government thereupon undertook again the improvement.

A board of engineer officers (H. Doc. No. 119, 55th Cong., 3d sess., with map, published in Report of the Chief of Engineers, 1899, p. 1973) recommended the improvement by parallel jetties, but the work was confined by the acts of Congress of June 13, 1902, and March 3, 1905, to the completion of the north jetty in accordance with the design and specifications of the Aransas Pass Harbor Co., and to such additional work as should be necessary for strengthening the jetty and removing obstructions in the channel.

Work was completed in accordance with the above-mentioned specifications June 11, 1906, at a cost to the Government of $546,703.10, but after the completion of the north jetty the channel became steadily worse, approaching dangerously near the jetty, and finally a secondary channel, 600 feet wide and 6 feet deep, broke through the gap between jetty and shore with the result that for all practical purposes the channel was on the north side of the jetty instead of the south side, as intended by the plan adopted by the Aransas Pass Harbor Co.

The project adopted by the river and harbor act of March 2, 1907, provided for improvement in accordance with plans submitted by the Board of Engineers for River and Harbors in its report of December 22, 1906, printed in Rivers and Harbors Committee Document No. 5, Fifty-ninth Congress, second session. This project provided, in the main, for a south jetty parallel to the general direction of existing jetty and the extension shoreward of the north jetty to connect with St. Joseph Island, and later the extension of both jetties. The estimated cost of the work, including $100,000 for a dredge, was $1,288,699.50.

At the beginning of the present fiscal year a total of $1,157,500 had been appropriated, the last appropriation ($217,500) having been made by the river and harbor act of June 25, 1910, for completing the improvement in accordance with the report submitted in House Document No. 639, Sixty-first Congress, second session, by securing a channel depth of 20 feet, repairs to the north jetty, the removal of the old jetties, the removal of the steamship *Mary*, and dredging, at an estimated cost for this work of $277,500. The project of 1907 had been extended by these appropriations to repairing the north jetty, dredging, and removing obstructions in the channel; and had been diminished by omitting the seaward extension of 1,750 feet of the jetties. The cost of the revised project is now $1,157,500.

The sum of $25,000 was appropriated by the river and harbor act of February 27, 1911, for maintenance.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $1,149,363.87; of such amount $167,930.47 was applied to maintenance of improvement. From miscellaneous sources, such as sales, etc., $16.10 was derived.

The north jetty is 9,241 feet long and the south jetty 6,400 feet long.

During the year the following work was accomplished:

One thousand and seventy linear feet of the old Mansfield Jetty was destroyed to a depth of 25 to 30 feet below mean low tide, using Government plant and hired labor.

Dredging in the channel by the U. S. dredge *Gen. C. B. Comstock* was carried on, and 381,302 cubic yards of material removed, which was for improvement. The approved project is 99 per cent completed.

The latest survey shows a channel 20 feet deep and 340 feet wide from end of the jetties to near Station C; thence a channel 20 feet deep and 250 feet to about 300 feet west of Station C, and 20 feet wide with good navigable width for the remainder of the length of the improvement.

The tonnage carried through the channel during the calendar year 1911 amounted to 8,880 short tons, valued at $863.000. The project has had as yet no permanent improvement on freight rates. Its effect on rates will soon, however, be felt, as it is understood that the Texas State Railway Commission favor prescribing rates on a parity with Galveston.

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the project.

July 1, 1911, balance unexpended	$96,598.19
Proceeds of sales of contact prints	3.80
	96,601.99
June 30, 1912, amount expended during fiscal year. for works of improvement	59,376.71
July 1, 1912. balance unexpended	37,225.28
July 1, 1912, outstanding liabilities	17,634.45
July 1, 1912, balance available	19,590.83
Amount that can be profitably expended in fiscal year ending June 30. 1914, for maintenance of improvement	[1] 50,000.00

(See Appendix T 13.)

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[1] Exclusive of the balance unexpended July 1, 1912.

14. Deep-water harbor at Harbor Island, Aransas Pass, Tex.—A depth of 20 feet having been provided through Aransas Pass, it became necessary to establish a deep-water harbor or port for the shipping. The river and harbor act of February 27, 1911, provided for the establishment of such a harbor at Harbor Island, which lies opposite the entrance channel through the pass.

The project is in accordance with the report printed in House Document No. 1094, Sixty-first Congress, third session, and provides for a roadstead 20 feet deep, 1,200 feet wide, and 3,000 feet long between Harbor and St. Joseph Islands, and for a channel of similar depth, 400 feet wide and 5,420 feet long, leading from the northern end of the roadstead, and for a protective stone dike 10,000 feet long on St. Joseph Island, connecting with the north jetty. The estimated cost of the work was $375,000, with $25,000 annually for maintenance after completion.

The act made an appropriation of $125,000 and authorized continuing contracts in the additional sum of $250,000 for completion of the project, which amount was appropriated by the sundry civil act approved August 24, 1912. The act of 1911 provided also that no part of the appropriation and authorization should be expended until the Secretary of War is satisfied that the interests of the general public will be duly protected in the use of the harbor and that no terminal monopoly will be possible, and that the title and easements in any land needed in the construction of the dike proposed as a part of the improvement shall have been vested in the United States free of cost. In fulfillment of these conditions, the Legislature of the State of Texas has passed a law prohibiting a terminal monopoly at this harbor, and deeds for the land required for the dike have been secured.

Work was, therefore, begun on this project October 27, 1911, and to the close of the fiscal year ending June 30, 1912, the amount expended has been $107,096.46, none of which was for maintenance.

During the year 10,000 linear feet of riprap dike on St. Joseph Island was completed under contract with D. M. Picton & Co., of Galveston, Tex., at a cost of $201,503.25.

Under contract of Bowers Southern Dredging Co., of Galveston, Tex., 53 per cent of the excavation for the deep-water harbor at Harbor Island was completed, at a cost of $77,570.02.

The ruling depth over that part of the deep-water harbor excavated was on June 30, 1912, 20 feet.

This project has had no effect on freight rates up to the end of the year.

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the project.

July 1, 1911, balance unexpended	$125,000.00
Proceeds of sales of contact prints	.30
	125,000.30
June 30, 1912, amount expended during fiscal year, for works of improvement	107,096.46
July 1, 1912, balance unexpended	17,903.84
Amount appropriated by sundry civil act approved Aug. 24, 1912	250,000.00

Amount available for fiscal year ending June 30, 1913	$267,903.84
July 1, 1912, outstanding liabilities	172,026.87
Net amount available for fiscal year ending June 30, 1913	95,876.97
July 1, 1912, amount covered by uncompleted contracts	68,554.68
Amount of continuing contract authorization, act of Feb. 27, 1911	250,000.00
Amount appropriated under such authorization	250,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 50,000.00

(See Appendix T 14.)

15. Channel from Aransas Pass to Corpus Christi, Tex.—Corpus Christi is situated on the western side of Corpus Christi Bay, 20.3 miles from Aransas Pass. A natural depression, known as Turtle Cove, started at Aransas Pass and, passing between Harbor and Mustang Islands, led to the eastern end of Corpus Christi Bay. It had an approximate depth of 1½ feet at mean low tide. The distance through Turtle Cove to 8 feet of water in the bay was about 6 miles. The natural depth in the bay to Corpus Christi varied from 8 to 14 feet.

Under a previous project a channel 8½ feet deep at mean low tide and 75 feet wide at the bottom through Turtle Cove was authorized in 1907 and completed in 1909 as a part of the inland waterway on the coast of Texas. The total amount spent under this appropriation was $126,723.57. (See (*e*) Turtle Cove Channel between Aransas Pass and Corpus Christi, p. 712 of this report.)

The present project, as adopted by the river and harbor act of June 25, 1910, provides for a 12-foot channel with bottom width of 100 feet through Turtle Cove Channel and Corpus Christi Bay, between Aransas Pass and Corpus Christi, in accordance with report printed in House Document No. 678, Sixty-first Congress, second session. The estimated cost, including $50,000 for the construction of a dredge for maintenance, was $207,900, with $35,000 annually for maintenance.

During the year 40,200 linear feet of channel was dredged to a depth of 12 feet of water in Corpus Christi Bay, at an expenditure of $105,083.01, completing about 90 per cent of the proposed work.

At the close of the fiscal year ending June 30, 1912, the amount expended had been $129,687.88, none of which was for maintenance. The work consisted of dredging by contract to form the adopted channel.

The maximum draft that can be carried June 30, 1912, at mean low water, over the shoalest part of the locality is 9.9 feet. The variation of water surface is about 1 foot.

The channel is navigable throughout its length of 10 miles.

The amount of commerce carried through the channel is the same as carried through Aransas Pass (see p. 720 of this report), being 8,880 short tons, valued at $863,000.

Rates have been reduced on general merchandise 20 per cent less than railroad rates, and on cotton the rate has been reduced 13 cents per 100 pounds.

The report upon which this project is based contained an estimate of $50,000 for construction of a dredge to be used in maintaining the channel.

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[1] Exclusive of amount available for fiscal year 1913.

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the project.

July 1, 1911, balance unexpended	$133,636.44
Proceeds of sales of contact prints	2.50
	133,638.94
June 30, 1912, amount expended during fiscal year, for works of improvement	105,423.82
July 1, 1912, balance unexpended	28,215.12
July 1, 1912, outstanding liabilities	10,000.00
July 1, 1912, balance available	18,215.12
July 1, 1912, amount covered by uncompleted contracts	2,676.86
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 10,000.00

(See Appendix T 15.)

16. Construction of sea wall, embankment, and fill along the front of Fort Crockett Reservation, Galveston, Tex., and constructing sea wall from Thirty-ninth Street to the west line of Forty-fifth Street, in the city of Galveston.—The sundry civil act approved April 28, 1904, contained an item for the protection of the sea front of the Fort Crockett Reservation, and appropriated $591,046.25 for the purpose.

By sundry civil act approved June 30, 1906, an additional amount of $158,953.75 was appropriated for completing the work.

Construction of the sea wall and riprap embankment along the western boundary of the reservation was completed October 18, 1905. A retaining wall of dry stone has been placed along the north and east sides of the reservation, thus surrounding the reservation with walls. The area inclosed has been filled with sand and a top dressing of soil, with sodding.

Concrete sidewalk and curbing and brick pavement with bituminous filler was constructed in rear of the sea wall.

The work contemplated is now completed; the amount on hand will be held for maintenance.

This work was carried out in accordance with report of a Board of Engineers, dated December 19, 1902. (See Appendix W 13, Report of Chief of Engineers, 1903.)

The amount expended on existing project to June 30, 1912, was $735,293.78.

July 1, 1911, balance unexpended	$14,754.58
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	46.86
July 1, 1912, balance unexpended	14,707.72
July 1, 1912, outstanding liabilities	99.92
July 1, 1912, balance available	14,607.80

(See Appendix T 16.)

EXAMINATION AND SURVEY REQUIRED BY THE RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

Reports dated June 5, 1909, and December 3, 1910, with map, on preliminary examination and survey, respectively, of *Brazos River*,

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[1] Exclusive of the balance unexpended July 1, 1912.

Tex., with a view to the selection of sites for the additional locks and dams between Old Washington and Waco, required by the river and harbor act of March 3, 1909, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 95, Sixty-second Congress, first session. The approximate locations of seven additional locks and dams have been selected, as shown in the profile on the index sheet printed with the said document, and recommended for adoption, subject to such modifications as more detailed investigations at the time of construction indicate to be desirable.

The local officer was also charged with the duty of making a preliminary examination and survey of *Brazos Santiago Harbor, Tex.*, provided for in the river and harbor act of March 3, 1909, and reports thereon will be duly submitted when received.

EXAMINATION MADE IN COMPLIANCE WITH THE RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Report dated September 7, 1910, on preliminary examination of *Brazos River, Tex., with a view to preventing a cut off at Jupiters Cut*, required by the river and harbor act approved June 25, 1910, was duly submitted by the district officer. It was reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and was transmitted to Congress and printed in House Document No. 280, Sixty-second Congress, second session. The improvement of this locality by the United States is not deemed worthy of being undertaken at the present time.

The local officer was also charged with the duty of making other preliminary examinations and surveys required by the river and harbor acts approved June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. Old (Trinity) River, Tex., in Chambers County, with a view to securing increased depth.

2. Tres Palacios River, Tex.

3. Guadalupe River, Tex, to Victoria, with a view to improvement by locks and dams.

4. Colorado River, Tex., with a view to improvement by locks and dams.

5. The mouth of the Brazos River to Velasco, Tex.

IMPROVEMENT OF RIVERS AND HARBORS IN THE DALLAS, TEX., DISTRICT.

This district was in the charge of Maj. T. H. Jackson, Corps of Engineers. Division engineer, Lieut. Col. Lansing H. Beach, Corps of Engineers.

1. Johnsons Bayou, La.—This stream is in the extreme southwestern portion of Louisiana, runs northwesterly to Sabine Lake, La., and is approximately 25 miles long. It is under improvement at the mouth only.

A preliminary survey made in 1897 showed a minimum depth of channel of 12 feet, and only 2½ feet over the bar at the mouth of the bayou at mean low water.

The project of April, 1899, printed in House Document No. 299, Fifty-fourth Congress, second session, provided for dredging a 6-foot channel through the bar at the mouth of the bayou of such width as the appropriation ($2,500) would permit.

This work was completed during December, 1899, and a channel 6 feet deep and 60 feet wide secured. No work having been carried on from that date to 1904, and none being considered necessary at that time, the unexpended balance of the appropriation, $238.65, was carried to the surplus fund in the Treasury on June 30, 1904. The total amount expended on the original project was $2,261.35.

The river and harbor act of March 2, 1907, appropriated $2,500 for this improvement, and an examination of the bar at the mouth of the bayou was made, but the district officer reported this stream to be unworthy of further expenditure for either improvement or maintenance by the United States.

The amount expended on this examination was $46, leaving an unexpended balance of $2,454. In November, 1908, an additional examination was ordered, and made at a cost of $86.50, which resulted in a recommendation by the district officer that the available balance, $2,367.50, be expended in dredging a channel across the bar, using the U. S. dredge *Port Arthur.*

This recommendation was approved, and in the month of May, 1910, a channel was dredged at the mouth of Johnsons Bayou 2,100 feet long, 90 feet wide, with an average depth of 6½ feet at mean low Gulf level, at a cost of $1,738.39.

This dredged channel being out in Sabine Lake and unprotected by revetments, rapidly deteriorated. A survey of the dredged channel, made in February, 1911, showed that it had almost completely filled up and redredging was necessary.

Additional funds being allotted in March, 1911, the U. S. dredge *Port Arthur* was moved to Johnsons Bayou Bar, and on March 27 began redredging channel across bar into Sabine Lake. This dredging was completed May 5, 1911, resulting in securing a channel 2,200 feet long, 110 feet wide, and an average of 7 feet deep at mean low Gulf level.

During the year $0.22 was expended in the payment of an outstanding liability from the previous fiscal year, making the total expenditures to June 30, 1912, $6,557.04.

Comparative statement of shipments and receipts.

Calendar year.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1908	5,314		
1909	4,188		1,126
1910	3,167		1,021
1911	2,331		836

On June 30, 1911, there existed 6½ feet of water through the new channel (110 feet wide) at mean low Gulf level. The usual variation in tide is 1 foot. Johnsons Bayou is navigable for 5 miles, to the settlement of Johnsons Bayou, La. This navigation is carried on by means of barges and gasoline launches.

Report on examination of this stream will be found on page 1790, Annual Report of the Chief of Engineers for 1897, which report does not contain maps.

Since June 30, 1911, the channel across the bar at the mouth has silted and now has a depth of 4.5 feet and a width of 60 feet. It is believed that the channel secured in the fiscal year 1911 should be kept open, and that commerce will increase as continued depth is maintained. The amount estimated for maintenance of improvement during the fiscal year 1914 is for maintaining depth by dredging.

July 1, 1911, balance unexpended	$204.53
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	.22
July 1, 1912, balance unexpended	204.31
Amount appropriated by river and harbor act approved July 25, 1912	2,500.00
Amount available for fiscal year ending June 30, 1913	2,704.31
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 2,500.00

(See Appendix U 1.)

2. Mouths of Sabine and Neches Rivers, Tex.—The Sabine River rises in northeast Texas and flows southeasterly approximately 400 miles to Sabine Lake. The lower portion, from Sabine Lake to Orange, Tex., about 10 miles, is under improvement. The Neches River rises in northeast Texas and flows southeasterly approximately 300 miles, to Sabine Lake. The lower 23 miles, from Sabine Lake to Beaumont, Tex., is under improvement.

Prior to improvement there was 3½ feet of water over the bar at the mouth of the Sabine River and 3 feet over the bar at the mouth of the Neches River. Dredging was carried on at the mouth of the Sabine River in 1880 and 1895 and a channel 60 feet wide and 7 feet deep secured. At the mouth of the Neches River dredging was carried on in 1880, 1889, and 1895, and a channel 50 feet wide and 5 feet in depth for a length of 8,000 feet was obtained. Funds were exhausted before deep water in Sabine Lake was reached. In 1897 the channel at the mouth of the Sabine River still afforded a depth of 7 feet, while the channel at the mouth of the Neches River had shoaled to 4 feet.

The act of March 3, 1899, appropriated $10,000 for improving the mouths of these streams, the appropriation to include the expense of reexamination of the proposed channel through Sabine Lake by a board of engineer officers.

The board constituted in compliance with this act submitted on August 11, 1899, a report on the proposed channel through Sabine Lake.

The project approved July 14, 1899, provided for dredging from deep water in Neches River to deep water in Sabine Lake. Under this project an 8-foot channel 7,829 feet in length was dredged from the 7-foot contour in Sabine Lake. A part of the appropriation was expended in deepening the channel across the bar at the mouth of the Sabine River.

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[1] Exclusive of amount available for fiscal year 1913.

The river and harbor act of March 3, 1905, adopted a project for dredging a channel 100 feet wide and 9 feet deep from the mouths of Sabine and Neches Rivers to the mouth of Taylors Bayou, through Sabine Lake at or near its western shore, as outlined in a report printed in House Document No. 634, Fifty-eighth Congress, second session, at an estimated cost not to exceed $536,500, with the following provisions: "That the channel may, in the discretion of the Secretary of War, be constructed through the land near the lake for any part of said route" and "that the right of way is furnished without expense to the United States."

Work under this project was begun March 1, 1906, and completed February 20, 1908, having been badly delayed on account of difficulties in securing the right of way.

The river and harbor act of March 2, 1907, authorized the extension of the channel at its southern end to a junction with the Port Arthur Canal and the widening of the canal in front of Port Arthur. Work on the extension was begun April 8, 1908, and was completed May 23, 1908.

The river and harbor act of February 27, 1911, made provision for deepening this canal to 25 feet. (See report on channel from Orange and Beaumont, on the Sabine and Neches Rivers, to Port Arthur Ship Canal, Tex., here below.)

Total length of completed canal from Port Arthur Ship Canal to mouth of Sabine River is 84,660 feet, or practically 16 miles. (See p. 1546, appendix, report of 1908.)

During the fiscal year 1912, $7,740.71 was expended dragging the channel for sunken obstructions and removing same, restoring the reference line of the Sabine-Neches Canal, and the purchase of the motor boat *Neches*.

The amount expended to June 30, 1912, was $480,971.92, of which $9,925.29 was expended on original and modified projects prior to the operations under the existing project.

On June 30, 1912, at ordinary high tide vessels drawing 11 feet of water could use this canal. The usual tidal variation is 1 foot.

Comparative statement of shipments and receipts.

NECHES RIVER.

	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
Calendar year—			
1902	145,740		
1903	151,672	5,932	
1904	161,516	9,844	
1905	173,504	11,988	
1906	178,656	5,152	
1907	150,040		28,616
1908	156,204	6,164	
1909	157,277	1,073	
1910	107,028		50,249
1911	235,394	128,366	

Comparative statement of shipments and receipts—Continued.

SABINE RIVER.

	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
Year ending May 31—			
1897	245,364		25,898
1898	275,506	30,142	
1899	270,642		4,864
Calendar year—			
1899	407,372	137,730	
1900	[1] 32,148		375,224
1901	459,909	427,761	
1902	413,174		46,735
1903	325,761		87,413
1904	292,184		33,577
1905	198,210		93,974
1906	409,870	211,660	
1907	405,172		4,698
1908	308,825		96,347
1909	341,225	45,400	
1910	287,068		57,157
1911	417,933	130,865	

[1] Incomplete; full statistics could not be obtained.

SABINE-NECHES CANAL.

Calendar year—			
1908	110,992		
1909	111,025	33	
1910	106,240		4,785
1911	259,776	153,536	

During the calendar year 1911, 259,776 short tons of freight, valued at $1,279,962, were moved over the Sabine-Neches Canal, consisting principally of sand and shell, lumber, crude oil, fresh water, general merchandise, etc.

Practically the only general freight business now done on the Sabine-Neches Canal is the conveying of lumber and square timber from Orange, Tex., to the Port Arthur docks. The freight rate by rail on this commodity from Orange to the Port Arthur docks is 5 cents per hundred pounds, equal to $2 per thousand feet board measure. The rate by water on square timber in rafts, owners furnishing dogs and chains and dogging their own timber, is 50 cents per thousand feet board measure. The water rate on lumber on barges, the carrier furnishing the barges, is $1 per thousand feet board measure.

On all lumber loaded on vessels at Port Arthur docks, if the lumber was brought in by rail, the wharf charges are 15 cents per thousand feet board measure. If brought in by water the wharf charges are 30 cents per thousand feet board measure.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Sabine River					1871 [1] 1873 [1] 1880 [1] 1892 [1] 1897 [1]	542 681 1195 1513 1778
Do	House	[1] 490	Sixtieth	First	1908 [1]	486
Neches River					1874 [1] 1879 [1] 1880 [1] 1893 [1]	745 905 1202 1853
Sabine and Neches Rivers	House	[2] 100	Fifty-sixth	First	1900 [1]	2302
	do	[2] 634	Fifty-eighth	Second	1904 [1]	1927
Sabine and Neches Rivers and Sabine-Neches Canal.	do	[2] 836	Sixty-first	do	1911 [1]	602

[1] No maps.

[2] Contains maps.

July 1, 1911, balance unexpended	$73,272.39
Amount received since from sale of condemned property	67.50
	73,339.89
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	7,740.71
July 1, 1912, balance unexpended	65,599.18
July 1, 1912, outstanding liabilities	782.20
July 1, 1912, balance available	64,816.98

(See Appendix U 2.)

3. Sabine-Neches Canal, including Sabine River to Orange and Neches River to Beaumont, Tex.—The river and harbor act approved March 3, 1909, provided for a preliminary examination of channel extending from the mouths of the Sabine and Neches Rivers to the mouth of Taylors Bayou, including the Sabine River from Orange to said canal, and the Neches River from Beaumont to said canal, with a view to widening and deepening said canal and removing the obstructions in the said rivers and improving the same; and in making such examination or survey the engineer or engineers having the same in charge shall take into account and make report upon any proposition for participation in the expense of said project by the localities immediately affected thereby. Reports on the examination and survey are printed in House Document No. 836, Sixty-first Congress, second session.

The river and harbor act approved June 25, 1910, provided for a reconsideration of the report on the improvement of the Sabine-Neches Canal, the Neches River up to Beaumont, and the Sabine River up to Orange, by a special board of engineers. The report of the board convened thereunder is printed in House Document No. 1290, Sixty-first Congress, third session.

The river and harbor act of February 27, 1911, contains a provision for improving the Sabine and Neches Canal from the Port

Arthur Ship Canal to the mouth of the Sabine River, the Neches River up to the town of Beaumont, and the Sabine River up to the town of Orange, to a navigable depth of 25 feet, in accordance with Plan No. 4, submitted in House Document No. 1290, Sixty-first Congress, third session, as follows:

For sections "a" and "c" from Port Arthur Ship Canal to mouth of Neches River and from mouth of Neches River to Beaumont, one hundred and fifty thousand dollars; and the Secretary of War may enter into contract or contacts for such materials and work as may be necessary to complete said sections to an amount not exceeding seven hundred and six thousand dollars, exclusive of the amount herein appropriated, of which amount not exceeding two hundred and seventy-eight thousand dollars shall be paid from appropriations to be hereafter made by law and the remainder from funds contributed by the Beaumont navigation district or other local interests: *Provided*, That no part of these amounts shall be expended and no contract shall be entered into until the Beaumont navigation district, a local organization created and existing under and by virtue of the laws of the State of Texas, or other local interests, shall have placed in some United States depository, to be selected by the Secretary of War, the sum of four hundred and twenty-eight thousand dollars to the credit of the Secretary of War, to be expended by him in equal amounts with moneys provided by the United States in prosecuting this work: *Provided further*, That said Beaumont navigation district or other local interests shall become bound, in manner satisfactory to the Secretary of War, to maintain said channel free of cost to the United States for a term of three years after the completion thereof, and to provide for the operation and maintenance of the guard lock without cost to the United States until otherwise provided by law, all in accordance with the recommendations in the report cited above: *Provided further*, That the Secretary of War may enter into contract for work on sections "a" and "c" at any time after the local interests have provided the moneys as above specified, independent of and without reference to section "b."

For section "b" fifty thousand dollars; and the Secretary of War may enter into contract or contracts for such materials and work as may be necessary to complete said section, to an amount not exceeding two hundred and thirty-seven thousand dollars, exclusive of the amount herein appropriated, of which amount not exceeding ninety-three thousand five hundred dollars shall be paid from appropriations to be hereafter made by law, and the remainder from funds contributed by the Orange navigation district or other local interests: *Provided*, That no part of these amounts shall be expended and no contract shall be entered into until the Orange navigation district or other local interests shall have placed in some United States depository, to be selected by the Secretary of War, the sum of one hundred and forty-three thousand five hundred dollars to the credit of the Secretary of War, to be expended by him in equal amounts with moneys provided by the United States in prosecuting this work: *Provided further*, That said Orange navigation district or other local interests shall become bound, in manner satisfactory to the Secretary of War, to maintain said channel free of cost to the United States for a term of three years, all in accordance with the recommendations in the report cited above.

The total initial cost of the improvement is estimated at $1,143,000, of which amount the local interests are to contribute one-half, making the net initial cost to the Government $571,500. The estimated cost of maintenance is $50,000 annually.

The river and harbor act approved July 25, 1912, contains the following item:

Improving the Sabine-Neches Canal, Texas, from the Port Arthur Ship Canal to the mouth of the Sabine River, the Neches River up to the town of Beaumont, and the Sabine River up to the town of Orange: The authorization for the improvement adopted by the river and harbor act of February twenty-seventh, nineteen hundred and eleven (Thirty-sixth Statutes, page nine hundred and forty-three), is hereby extended so as to include the cutting off of bends or

the widening of the channels to such extent as may be recommended by the Chief of Engineers and approved by the Secretary of War: *Provided,* That the total cost shall not be increased beyond that specified in the act of February twenty-seventh, nineteen hundred and eleven: *Provided, further,* That nothing herein contained shall change the terms of cooperation specified in said act.

The amount of $428,000 was placed in depositories designated by the Secretary of War during the month of June, 1911, by the Beaumont navigation district of Jefferson County, Tex., which navigation district at the same time became bound in manner satisfactory to the Secretary of War to maintain the channel and provide for the operation and maintenance of the guard lock, as provided by Congress.

The amount of $143,500 was placed in depositories designated by the Secretary of War during the month of October, 1911, by the Orange County navigation district; and on October 18, 1911, the Orange County navigation district became bound in manner satisfactory to the Secretary of War to maintain the channel in section "b" as provided by Congress.

During the fiscal year 1912 contract was entered into for dredging approximately 7,291,000 cubic yards, and clearing approximately 30 acres, in sections "a" and "c." Approximately 310,570 cubic yards were dredged under this contract during the fiscal year.

Advertisement and specifications were issued calling for bids for dredging in section "b" during the year, the bids to be opened July 20, 1912.

There was expended on this project to the end of the fiscal year the sum of $29,558.68.

The amount estimated for expenditure in the fiscal year ending June 30, 1914, is for carrying on the project under the continuing-contract authorization in the act of February 27, 1911. A Federal appropriation of $290,000 will render available for expenditure an equal amount from the funds contributed by private parties.

SECTIONS A AND C—GOVERNMENT APPROPRIATION.

July 1, 1911, balance unexpended	$150,000.00
June 30, 1912, amount expended during fiscal year, for works of improvement	12,244.93
July 1, 1912, balance unexpended	137,755.07
July 1, 1912, outstanding liabilities	335.75
July 1, 1912, balance available	137,419.32
Amount appropriated by sundry civil act approved Aug. 24. 1912	35,000.00
Amount available for fiscal year 1913	172,419.32
July 1, 1912, amount covered by uncompleted contracts	[1] 518,323.87
Amount of continuing contract authorization, act of Feb. 27, 1911	278,000.00
Amount appropriated under such authorization	35,000.00
Amount yet to be appropriated	243,000.00
Amount (estimated) required to be appropriated for completion of existing project	[2] 243,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[2] 215,000.00

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[1] Including both Government and private funds.

[2] Exclusive of amount available for fiscal year 1913.

SECTIONS A AND C—PRIVATE FUNDS.

July 1, 1911, balance unexpended	$428,000.00
June 30, 1912, amount expended during fiscal year, for works of improvement	12,244.93
July 1, 1912, balance unexpended	415,755.07
July 1, 1912, outstanding liabilities	335.75
July 1, 1912, balance available	415,419.32
July 1, 1912, amount covered by uncompleted contracts	[1] 518,323.87

SECTIONS A AND C—GOVERNMENT AND PRIVATE FUNDS CONSOLIDATED.

July 1, 1911, balance unexpended	$578,000.00
June 30, 1912, amount expended during fiscal year, for works of improvement	24,489.86
July 1, 1912, balance unexpended	553,510.14
July 1, 1912, outstanding liabilities	671.50
July 1, 1912, balance available	552,838.64
Amount appropriated by sundry civil act approved Aug. 24, 1912	35,000.00
Amount available for fiscal year 1913	587,838.64
July 1, 1912, amount covered by uncompleted contracts	518,323.87
Amount of continuing contract authorization, act of Feb. 27, 1911	278,000.00
Amount appropriated under such authorization	35,000.00
Amount yet to be appropriated	243,000.00
Amount (estimated) required to be appropriated for completion of existing project	[2] 243,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[3] 215,000.00

SECTION B—GOVERNMENT APPROPRIATION.

July 1, 1911, balance unexpended	$50,000.00
June 30, 1912, amount expended during fiscal year, for works of improvement	2,534.41
July 1, 1912, balance unexpended	47,465.59
July 1, 1912, outstanding liabilities	47.75
July 1, 1912, balance available	47,417.84
Amount of continuing contract authorization, act of Feb. 27, 1911	93,500.00
Amount yet to be appropriated	93,500.00
Amount (estimated) required to be appropriated for completion of existing project	[2] 93,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[3] 75,000.00

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[1] Including both Government and private funds.

[2] Exclusive of amount available for fiscal year 1913.

[3] Exclusive of the balance unexpended July 1, 1912.

SECTION B—PRIVATE FUNDS.

Amount contributed by Orange navigation district	$143,500.00
June 30, 1912, amount expended during fiscal year, for works of improvement	2,534.41
July 1, 1912, balance unexpended	140,965.59
July 1, 1912, outstanding liabilities	47.75
July 1, 1912, balance available	140,917.84

SECTION B—GOVERNMENT AND PRIVATE FUNDS CONSOLIDATED.

July 1, 1911, balance unexpended	$50,000.00
Amount contributed by Orange navigation district	143,500.00
	193,500.00
June 30, 1912, amount expended during fiscal year, for works of improvement	5,068.82
July 1, 1912, balance unexpended	188,431.18
July 1, 1912, outstanding liabilities	95.50
July 1, 1912, balance available	188,335.68
Amount of continuing contract authorization, act of Feb. 27, 1911	93,500.00
Amount yet to be appropriated	93,500.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 93,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 75,000.00

SECTIONS A AND C AND B—CONSOLIDATED GOVERNMENT AND PRIVATE FUNDS.

July 1, 1911, balance unexpended	$628,000.00
Amount contributed by Orange navigation district, section b	143,500.00
	771,500.00
June 30, 1912, amount expended during fiscal year, for works of improvement	29,558.68
July 1, 1912, balance unexpended	741,941.32
July 1, 1912, outstanding liabilities	767.00
July 1, 1912, balance available	741,174.32
Amount appropriated by sundry civil act approved Aug. 24, 1912	35,000.00
Amount available for fiscal year ending June 30, 1913	776,174.32
July 1, 1912, amount covered by uncompleted contract (sections a and c)	518,323.87
Amount of continuing contract authorization, act of Feb. 27, 1911	371,500.00
Amount appropriated under such authorization	35,000.00
Amount yet to be appropriated	336,500.00
Amount (estimated) required to be appropriated for completion of existing project	[2] 336,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[2] 290,000.00

(See Appendix U 3.)

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[1] Exclusive of the balance unexpended July 1, 1912.
[2] Exclusive of amount available for fiscal year 1913.

4. *Operating and care of Port Arthur Canal, Tex.*—This service is provided for by the permanent indefinite appropriation for operating and care of canals and other works of navigation, under the provisions of section 4 of the river and harbor act of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909.

Under the provisions of an act of Congress approved June 29, 1906, there was conveyed to the United States, free of cost, the Port Arthur Canal, the lumber basin, and the turning basin, together with a strip of land along the canal. The deed of conveyance from the Port Arthur Channel & Dock Co. was accepted by the Secretary of War on December 13, 1906, from which date the canal became a public water of the United States. Cession of jurisdiction over the property was executed by the governor of the State of Texas on February 27, 1907.

The Port Arthur Canal was built by a company interested in establishing a port somewhat removed from the Gulf, and was dredged to a depth of 25 feet. A dredge which was operated in maintaining the canal for over three years has been purchased by the United States.

The dredge *Port Arthur* was operated in the canal, dredging shoal places to a depth of between 26 and 27 feet from the beginning of the year until November 22, 1911, when the dredge was taken to Port Arthur, Tex., and laid up.

On July 24, 1911, contract was approved for dredging in the turning basin at the head of the canal. This contract was completed November 29, 1911, the total number of cubic yards dredged thereunder being 189,135.26, at a total cost of $19,670.07.

Under date of January 10, 1912, the Chief of Engineers authorized the hiring of a 20-inch hydraulic pipe-line dredge, at a cost of $20 per working hour, to perform dredging in the turning basin which it was impossible to perform with the dredge *Port Arthur*. The amount of material dredged by the dredge so hired was approximately 24,000 cubic yards, the cost being $5,981.67.

Under date of October 5, 1911, contract was approved for the construction of one complete wooden-hull 15-inch pipe-line dredge, now the *Orange*, at a cost of $84,520. This dredge was delivered at Port Arthur, Tex., May 16, 1912.

A lease was entered into June 10, 1912, for the tug *Captain Nelson*, to be used in conjunction with the proper operation of the dredge *Orange*, the price stipulated therein being $375 per month.

During the year the Chief of Engineers authorized the acquiring of a tug, to be named *Beaumont*, for use in conjunction with the dredge *Orange*. Specifications for this tug were in the course of preparation at the end of the fiscal year.

The maximum usable depth in the canal on June 30, 1912, was 25 feet. The usual variation of the tide is 1½ feet.

The amount expended to June 30, 1912, was $267,112.63, exclusive of outstanding liabilities, of which $124,500.79 was expended during the fiscal year 1912.

There were moved on this canal during the calendar year 1911 1,880,017 short tons of miscellaneous freight, consisting principally of crude petroleum and its refined products, cotton, lumber, and general merchandise, valued at $43,293,854.

Comparative statement of shipments and receipts.

Calendar year.	Short tons.	Change tonnage from previous year.	
		Increase.	Decrease.
1908	1,174,415		
1909	1,597,797	423,382	
1910	1,674,316	76,519	
1911	1,880,017	205,701	

For reference to reports of examinations and surveys see House Document No. 773, Sixty-first Congress, second session, which contains maps, and for new project adopted by the river and harbor act approved July 25, 1912, see harbor at Sabine Pass, Tex., page 737 of this report.

(See Appendix U 4.)

5. *Harbor at Sabine Pass, and Port Arthur Canal, Tex.*—The dimensions of the harbor at Sabine Pass are: Width, 1,700 feet to 3,000 feet; depth, 25 feet to 35 feet. The distance from Sabine Docks to Galveston, Tex., is 80 miles in a southwesterly direction, and to New Orleans, La., is 435 miles, in an easterly direction.

Prior to improvement there were depths of 18 and 17 feet, respectively, over the two bars in Sabine Pass, opposite the town of Sabine and opposite Fort Point. These bars were about 200 feet long. Throughout the other portions of the pass the least mean depth was 25 feet.

Beyond the shore line at the entrance to the pass there existed a bar about 3½ miles wide between the interior and exterior 18-foot bottom curves, over which there was not more than 6 feet of water at mean low tide. Channels 12 and 15 feet deep were dredged through this outer bar during 1878 and 1880, under the project of 1873, at a cost of $325,000, but they soon refilled.

The project of 1882 provided for the construction of parallel jetties at the entrance of the pass, 1,800 feet apart and about 4 miles in length from shore line to deep water in the Gulf, and for dredging the channel between these jetties if necessary. This work was designed to provide a channel of practicable width and a depth of 25 feet, at an estimated cost of $3,177,606.50.

Construction of the jetties began in 1883, and under successive appropriations has been carried on since that date.

The river and harbor act of 1896 authorized contracts for the completion of the project, limiting the cost to $1,050,000, all of which has been appropriated.

Under contract approved June 22, 1897, the east jetty was completed for a length of 21,818 feet, riprap work only was completed for a length of 682 feet, and foundation only for 2,600 feet. The west jetty had a length of 15,560 feet, of which 1,490 feet was only riprap work and 4,950 feet was foundation only. About 3,000 feet of previous work was capped.

Dredging in the channel was carried on, under contract, in 1897, 1898, and 1899, the depth being increased to 25 feet and the width to 100 feet. The channel was again dredged in 1900 and 1901, with an allotment of $8,000 from the emergency appropriation of June 6, 1900.

Under the act of March 3, 1899, $150,000 was appropriated for straightening, widening, and otherwise improving the harbor by the removal of oyster reefs and flats between the United States lifesaving station and a point opposite the United States lighthouse.

The work was completed April 18, 1903.

Act of June 13, 1902, appropriated $25,000 for widening and straightening the main ship channel and increasing its depth from a point 1,000 feet north of the life-saving station to the entrance of the Port Arthur Canal in accordance with report published in the Annual Report of the Chief of Engineers for 1901, page 1915. This work was completed February 27, 1903, and the channel depth was increased to 25 feet at mean low water for an average width of 400 feet.

The act of June 4, 1897, appropriated $100,000 for the construction of a dredge (the *Sabine*), which was completed January 14, 1901.

Since this date the dredge has worked in the channel between the jetties 93 months and 6 days and removed a total of 4,282,351 cubic yards. The remainder of the time she was either absent undergoing repairs or was engaged in emergency work at South Pass, Mississippi River.

The creation of the channel contemplated by the project has been completed. The existing project is for maintenance of a channel depth of 25 feet to be accomplished by dredging and the restoration of the jetties to a height of about 4 feet above mean low tide, at an estimated cost of $1,016,573.

The act of March 2, 1907, appropriated $160,000 for continuing improvement and for maintenance and authorized contracts for materials or work to the amount of $200,000, which has been appropriated and expended in repairing the east jetty for a distance of 13,800 feet, 113,893.31 tons of riprap stone being used for this repair work, the contract being completed December 19, 1908.

Allotment of $200,000 was made from the appropriation act of March 3, 1909, to continue this improvement and for maintenance.

The river and harbor act of June 25, 1910, appropriated $150,000 for continuing the improvement and for maintenance.

The river and harbor act of February 27, 1911, appropriated $150,000 for continuing improvement and for maintenance.

The dredge *Sabine* operated in the jetty channel during the fiscal year from July 1, 1911, to September 11, 1911. Since that date this dredge has either been undergoing repairs or awaiting repairs.

On October 2, 1911, contract was approved for the placing of approximately 27,100 tons in repairing the east and west jetties at Sabine Pass, at a cost of $2.87½ per ton for stone in place on the jetties. A total of 25,101.34 tons were placed during the year under this contract.

At favorable stages of the tide vessels have gone out during the year drawing 26 feet. The usual variation of the tide is 1½ feet. By continued work the dredge *Sabine* is just able to maintain a channel of about 25 feet depth, and the low portions of the jetties should be built up to a height of about 4 feet above mean low tide.

The river and harbor act approved July 25, 1912, adopted a new project for this locality in accordance with plan printed in House Document No. 773, Sixty-first Congress, second session, which contemplates the repair and building up of the jetties as far as the mattress foundation is laid, so as to provide a reasonably permanent channel of 25 feet navigable depth; dredging Port Arthur Canal 26 feet deep and 150 feet wide; and dredging a new turning basin 26 feet deep, 600 feet wide, and 1,700 feet long; all at an estimated cost of $2,000,000, with $290,000 for maintenance the first year, including the price of a new dredge, and $190,000 annually for maintenance thereafter, subject to the condition that the right of way for the turning basin, estimated to cost $10,000, shall be furnished free of cost to the United States. The act makes an appropriation of $433,800.

The amount expended to June 30, 1912, was $4,526,154.89, of which $325,000 was expended on previous projects. Of the amount expended on the present project it is estimated that $686,740.71 has been applied to maintenance of improvement.

The amount required for expenditure in the fiscal year ending June 30, 1914, namely, $600,000, will be required for continuing the work of maintenance by dredging and for extending the jetties on the mattress foundation in accordance with the project submitted in House Document No. 773, Sixty-first Congress, second session, adopted by the river and harbor act approved July 25, 1912.

There were moved on this waterway during the calendar year 1911 2,443,962 short tons of miscellaneous freight, consisting of principally crude petroleum and its refined products, sulphur, cotton, lumber, rice, and general merchandise, valued at $49,864,181.

Comparative statement of shipments and receipts.

	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
Year ending May 31—			
1897	87,632	88,746	
1898	238,400	150,768	
1899	326,982	88,582	
Calendar year—			
1899	326,494		488
1900	217,489		109,005
1901	150,087		67,402
1902	689,688	539,601	
1903	1,315,248	625,560	
1904	1,792,371	477,123	
1905	1,779,954		12,417
1906	1,904,389	124,435	
1907	1,848,159		56,230
1908	1,802,307		45,852
1909	2,185,786	383,479	
1910	2,304,113	118,327	
1911	2,443,962	139,849	

The improvement at Sabine Pass has caused a reduction in the local freight rates as stated in previous annual reports, but the freight rates to Port Arthur and Sabine, Tex., consist of the through rate to Beaumont plus a certain differential, which is applied by the State railway commission to all seaports.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No	Congress.	Session.	Year.	Page.
Sabine Pass					1878	[1] 684
					1875	[1] 945
					1882	[1] 1426
					1884	[1] 1286
					1885	[2] 1416
					1886	[1] 1286
					1889	[2] 1490
					1890	[2] 1756
	House	[1] 70	Fifty-sixth	Second	1901	[1] 1916
	do	[1] 152	do	do	1901	[1] 1910
	do	[2] 778	Sixty-first	do		

DREDGING.

July 1, 1911, balance unexpended	$105,941.85
Amount received from sale of condemned property	7.50
	105,949.35
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	25,958.68
July 1, 1912, balance unexpended	79,990.67
July 1, 1912, outstanding liabilities	3,848.39
July 1, 1912, balance available	76,142.28
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	([3])

JETTY WORK.

July 1, 1911, balance unexpended	$83,033.74
June 30, 1912, amount expended during fiscal year, for works of improvement	60,575.76
July 1, 1912, balance unexpended	22,457.98
July 1, 1912, outstanding liabilities	202.00
July 1, 1912, balance available	22,255.98
July 1, 1912, amount covered by uncompleted contracts	17,642.91

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[1] No maps. [2] Contains maps. [3] See consolidated money statement on p. 739.

Amount (estimated) required to be appropriated for completion of existing project	[1] $1,716,200.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	(2)

CONSOLIDATED.

July 1, 1911, balance unexpended		$188,975.59
Amount received from sale of condemned property		7.50
		188,983.09
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$60,575.76	
For maintenance of improvement	25,958.68	
		86,534.44
July 1, 1912, balance unexpended		102,448.65
July 1, 1912, outstanding liabilities		4,050.39
July 1, 1912, balance available		98,398.26
Amount appropriated by river and harbor act approved July 25, 1912		433,800.00
Amount available for fiscal year ending June 30, 1913		532,198.26
July 1, 1912, amount covered by uncompleted contracts		17,642.91
Amount (estimated) required to be appropriated for completion of existing project		[1] 1,716,200.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 600,000.00

(See Appendix U 5.)

6. Trinity River, Tex.—The Trinity River rises in north central Texas and flows approximately 675 miles southeasterly to Galveston Bay. The lower 512½ miles, from Dallas, Tex., to Galveston Bay, is under project in the Dallas district.

The river above tidal action is a narrow stream with a low-water depth insufficient for even light-draft navigation. Its banks, while generally high and quite stable, are subject to overflow during every flood of the river, and the adjacent bottom lands are overflowed. The improvement of the river for navigation by the method of canalization may somewhat complicate the flood problem.

The river and harbor act of June 13, 1902, adopted a project for the improvement of this stream in accordance with a report submitted in House Document No. 409, Fifty-sixth Congress, first session, making an appropriation of $125,000, and authorized continuing contracts in the sum of $275,000 additional for carrying out the work, all of which has since been appropriated. (See Annual Report of the Chief of Engineers for 1900, p. 2348.) This project contemplated improvement to provide a 6-foot navigation from Dallas to the mouth, a distance of 511 miles, by open-channel work and a system of locks and dams.

The original estimate of cost of this improvement was $4,550,000. The portion of this applicable to section 1 ($350,000) was afterwards raised to $918,000 in a report from a board of engineers appointed to examine into the cost. (See Annual Report of the Chief of Engineers for 1904, p. 2021.)

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[1] Exclusive of amount available for fiscal year 1913.

[2] See consolidated money statement on this page.

The amount expended on this improvement up to June 30, 1912, was $1,145,691.06.

Locks and Dams Nos. 1, 2, 4, and 6 have been authorized in section 1, and Lock and Dam No. 7 and locks and dams at Hurricane and White Rock Shoals have been authorized in the portion of the river below section 1. Locks and Dams Nos. 1 and 6 have been completed.

Contracts were entered into in 1908 for the construction of Locks and Dams Nos. 2 and 4, but the contractor abandoned work on these contracts during the fiscal year 1911, and since then the work of completing the locks and dams has been carried on by hired labor.

Work on the construction of Lock and Dam No. 7 was begun during the fiscal year.

Work on the construction of the lock and dam at Hurricane Shoals was continued during the fiscal year. A railroad (narrow gauge) from this lock site to Crockett, Tex., was under construction during the year, being completed to within 1½ miles of the site at the close of the year.

The work of construction of lock and dam at White Rock Shoals was begun during the fiscal year.

Lock No. 1 is at McComas Bluff, 13 miles below Dallas; the dam at Parsons Slough is 22 miles below Dallas; and Locks Nos. 2, 4, and 6 are 23, 30, and 42 miles, respectively, below Dallas. Lock and Dam No. 7, lock and dam at Hurricane Shoals, and lock and dam at White Rock Shoals are approximately 49, 243, and 334 miles below Dallas, respectively.

Snagging operations were carried on by means of one snag boat and three quarter boats.

The expenditures made in cleaning the river have resulted in no increased depth, but the removal of snags and drifts has made the stream safer to navigate at medium and high stages. There is no navigation above Liberty other than the rafting of logs.

Owing to the fact that the river is not yet navigable to Dallas, the only place at which it can come into active competition with the railroads, no effect on freight rates has been produced.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Trinity River					1871 [1]	557
					1878 [1]	665
		[1] Ex. 185	Forty-sixth	Second	1880 [1]	1288
	House	[1] 275	Fifty-first	do	1891 [1]	1936
	do	[1] 102	Fifty-fourth	First	1896 [1]	1551
	do	[2] 409	Fifty-sixth	do	1900 [1]	2348
	do	[1] 118	Fifty-eighth	Second	1904 [1]	2081

[1] No maps.

[2] Contains maps.

While the increased facilities due to removal of obstructions from this river have not been taken advantage of by local interests above Liberty and seem to have no value except in connection with a systematic improvement of the river by locks and dams, an estimate of $15,000 is submitted as the minimum amount required for the fiscal year 1914 to operate plant on hand for open-channel work, so as to facilitate all boat traffic allowed by natural-channel depths and to prevent deterioration of present channel.

The estimate submitted for lock and dam construction is the amount in addition to the amount probably on hand June 30, 1913, which can be advantageously expended during the fiscal year 1914 by hired labor in the construction of locks and dams heretofore authorized by Congress, as follows:

Lock and Dam at Hurricane Shoals	$85,000
Lock and Dam No. 7	85,000
Lock and Dam at White Rock Shoals	85,000
	255,000

If additional locks and dams are authorized by Congress, provision should be made by appropriations sufficiently large to permit of economical prosecution and prompt completion of the work undertaken. In order that the cost of construction may be kept within reasonable limits it is desirable that any locks and dams authorized in future by Congress for this river be constructed in such order as will permit such advantage as is possible to be taken of existing railroad crossings and of the pools formed by those dams previously constructed in arranging for transportation of materials to the locks and dams under construction. If this is not done and it is necessary to haul materials for construction overland to the lock sites the cost of the system will be very much greater than is necessary and much additional time will be required to complete the improvement.

If Congress does not decide that the locks and dams shall be built in order upstream, beginning with that one farthest downstream, it is recommended that at least those dams be built first which are located just below railroad crossings, to be followed by those next above such dams, etc. This will, in general, permit of the maximum possible economy of construction and will also create navigable stretches of the river each connecting with a railroad, thus facilitating the development of commerce.

Attention is invited to the remarks of the district officer on this subject in the appendix to this report.

The river and harbor act approved July 25, 1912, contains the following item:

> Improving Trinity River, Texas: Continuing improvement with a view to obtaining a depth of six feet between the mouth and Dallas by the construction of locks and dams heretofore authorized, and for an accurate instrumental survey of the river as recommended in the Annual Report of the Chief of Engineers for nineteen hundred and eleven, four hundred and twenty-five thousand dollars; continuing improvement and for maintenance by open-channel work, fifteen thousand dollars; in all, four hundred and forty thousand dollars.

OPEN-CHANNEL WORK.

July 1, 1911, balance unexpended	$54,064.68
Amount received from sales of condemned property, etc	49.00
	54,113.68
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	44,199.65

July 1, 1912, balance unexpended	$9,914.03
July 1, 1912, outstanding liabilities	1,312.13
July 1, 1912, balance available	8,601.90
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	15,000.00
Amount available for fiscal year ending June 30, 1913	23,601.90
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 15,000.00

SECTION 1.—FEDERAL APPROPRIATION.

July 1, 1911, balance unexpended	$11,228.00
Amount received from sale of plant to Locks and Dams Nos. 4 and 7 and Lock and Dam at Hurricane Shoals	7,900.00
Amount received from sales of condemned property, etc	422.55
	19,550.55
June 30, 1912, amount expended during fiscal year, for works of improvement	19,550.55
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	25,000.00
Amount available for fiscal year ending June 30, 1913	25,000.00

SECTION 1.—FUNDS CONTRIBUTED BY CITIZENS OF DALLAS, TEX.

July 1, 1911, balance unexpended	$9,741.65
June 30, 1912, amount expended during fiscal year, for works of improvement	9,741.65

LOCK AND DAM NO. 2.—SECTION 1 AND FUNDS CONTRIBUTED BY CITIZENS OF DALLAS, TEX.—CONSOLIDATED.

July 1, 1911, balance unexpended	$20,969.65
Amount received from sale of plant (by transfer of funds)	7,900.00
Amount received from sale of condemned property	422.55
	29,292.20
June 30, 1912, amount expended during fiscal year, for works of improvement	29,292.20
Amount allotted from appropriation made by river and harbor act of July 25, 1912	25,000.00
Amount available for fiscal year ending June 30, 1913	25,000.00

LOCK AND DAM NO. 4.

July 1, 1911, balance unexpended		$122,741.20
Amount received from sales condemned property, etc		172.25
		122,913.45
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$93,930.87	
For works of improvement, account of purchase of plant from "Section 1," Trinity River (by transfer of funds)	1,400.00	
		95,330.87
July 1, 1912, balance unexpended		27,582.58
July 1, 1912, outstanding liabilities		3,760.21
July 1, 1912, balance available		23,822.37
Amount allotted from appropriation made by river and harbor act of July 25, 1912		100,000.00
Amount available for fiscal year 1913		123,822.37
July 1, 1912, amount covered by uncompleted contracts		6,180.00

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[1] Exclusive of amount available for fiscal year 1913.

LOCK AND DAM AT HURRICANE SHOALS.

July 1, 1911, balance unexpended	$180,068.00
June 30, 1912, amount expended during fiscal year, for works of improvement	89,085.73
July 1, 1912, balance unexpended	90,982.27
July 1, 1912, outstanding liabilities	17,356.33
July 1, 1912, balance available	73,625.94
July 1, 1912, amount covered by uncompleted contracts	3,969.53
Amount (estimated) required to be appropriated for completion of existing project	[1] 160,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 85,000.00

LOCK AND DAM NO. 4 AND LOCK AND DAM AT HURRICANE SHOALS—CONSOLIDATED.

July 1, 1911, balance unexpended		$302,809.20
Amount received since from sale of condemned property, etc		172.25
		302,981.45
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$183,016.60	
For works of improvement on account of purchase of plant from "section 1," Trinity River, by transfer of funds	1,400.00	
		184,416.60
July 1, 1912, balance unexpended		118,564.85
July 1, 1912, outstanding liabilities		21,116.54
July 1, 1912, balance available		97,448.31
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		100,000.00
Amount available for fiscal year 1913		197,448.31
July 1, 1912, amount covered by uncompleted contracts		10,149.53
Amount (estimated) required to be appropriated for completion of existing project		[2] 160,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[2] 85,000.00

LOCK AND DAM NO. 7.

July 1, 1911, balance unexpended		$24,311.99
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$2,893.53	
For works of improvement, account of purchase of plant from section 1, Trinity River, by transfer of funds	3,250.00	
		6,143.53
July 1, 1912, balance unexpended		18,168.46
July 1, 1912, outstanding liabilities		1,105.41
July 1, 1912, balance available		17,063.05
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		200,000.00
Amount available for fiscal year 1913		217,063.05
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[2] 85,000.00

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[1] Exclusive of the balance unexpended July 1, 1912.

[2] Exclusive of amount available for fiscal year 1913.

LOCK AND DAM AT WHITE ROCK SHOALS.

July 1, 1911, balance unexpended		$23,974.18
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$4,003.74	
For works of improvement, account of purchase of plant from section 1, Trinity River, by transfer of funds	3,250.00	
		7,253.74
July 1, 1912, balance unexpended		16,720.44
July 1, 1912, outstanding liabilities		797.63
July 1, 1912, balance available		15,922.81
Amount (estimated) required to be appropriated for completion of existing project		[1] 200,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[1] 85,000.00

LOCK AND DAM NO. 7 AND LOCK AND DAM AT WHITE ROCK SHOALS—CONSOLIDATED.

July 1, 1911, balance unexpended		$48,286.17
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$6,897.27	
For works of improvement, account of purchase of plant from "section 1," Trinity River, by transfer of funds	6,500.00	
		13,397.27
July 1, 1912, balance unexpended		34,888.90
July 1, 1912, outstanding liabilities		1,903.04
July 1, 1912, balance available		32,985.86
Amount allotted from appropriation made by river and harbor act of July 25, 1912		200,000.00
Amount available for fiscal year 1913		232,985.86
Amount (estimated) required to be appropriated for completion of existing project		[2] 200,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[2] 170,000.00

INSTRUMENTAL SURVEY.

Amount allotted from appropriation made by river and harbor act approved July 25, 1912	$100,000.00
Amount available for fiscal year ending June 30, 1913	100,000.00

CONSOLIDATED.

July 1, 1911, balance unexpended		$426,129.70
Received since from sales of condemned property, etc		643.80
		426,773.50
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$219,206.07	
For maintenance of improvement	44,199.65	
		263,405.72
July 1, 1912, balance unexpended		163,367.78
July 1, 1912, outstanding liabilities		24,331.71
July 1, 1912, balance available		139,036.07
Amount appropriated by river and harbor act approved July 25, 1912		440,000.00
Amount available for fiscal year ending June 30, 1913		579,036.07
July 1, 1912, amount covered by uncompleted contracts		10,149.53

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[1] Exclusive of the balance unexpended July 1, 1912.

[2] Exclusive of amount available for fiscal year 1913.

Amount (estimated) required to be appropriated for completion of existing project	[1] $260,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 270,000.00

(See Appendix U 6.)

7. *Operating and care of locks and dams, section 1, Trinity River, Tex.*—Lock and Dam No. 1 was placed under this project March 1, 1909, the dam at Parsons Slough on January 16, 1911, and Lock and Dam No. 6 April 8, 1911.

This service is provided for by the permanent indefinite appropriation for operating and care of canals and other works of navigation, under the provisions of section 4 of the river and harbor act of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909.

No lockages have been made on account of the unusable condition of the river below Lock and Dam No. 1.

The completed locks and dams were maintained during the year.

There was expended up to June 30, 1912, $20,565.56, of which $3,951.98 was expended during the fiscal year.

(See Appendix U 7.)

8. *Cypress Bayou, Tex. and La.*—Cypress Bayou rises in northeast Texas, flows slightly southeastward approximately 119 miles to Caddo Lake, thence approximately 19 miles across Caddo Lake to Big Willow Pass, thence approximately 24 miles through Willow Pass, Soda Lake, and Twelvemile Bayou, to Red River, just above Shreveport, La., a total distance of about 162 miles. That portion between Jefferson, Tex., and Red River, about 68 miles, is under project in Dallas district.

During the period of the great raft in Red River the bottom lands of Cypress Bayou were flooded—became lakes—and afforded a navigable route from Red River, near Shreveport, La., to Jefferson, Tex., 65 miles. Work by the United States for the improvement of this route commenced in 1872, and from that date to 1879 $94,000 was appropriated for the purpose. The funds were expended for dredging and straightening the channel, removing stumps, snags, and logs, and cutting leaning timber. This work was completed in 1880, but on account of its temporary nature appropriations and allotments aggregating $39,701.33 were made for maintenance.

The removal of the raft and the subsequent closure of outlets and construction of levees down the right bank of Red River from the hills in Arkansas to near Shreveport, La., cut off the water supply of the lakes, which, in conjunction with the quicker drainage resulting from the lowering of the bed of Red River, gradually caused them to dry up. In consequence the period of navigation shortened from year to year until 1897, when boats from Red River ceased plying altogether.

The existing project is practically for maintenance by cleaning and clearing the bayou and lakes between Jefferson, Tex., and Mooringsport, La., of snags and other recurring obstructions.

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[1] Exclusive of amount available for fiscal year 1913.

The amount expended to June 30, 1912, was $156,258.25 for improvement and maintenance and $12,613.05 for surveys. The work of maintenance so merges into the work of improvement that it is difficult to state just what portion of the expenditures was for maintenance and what for improvement.

The water supply of the drainage basin of the lakes has been reduced so greatly and the channel of Red River above Shreveport has lowered so much that steamboats now can cross Albany Flats, at foot of the lake, only at rare intervals during exceptionally high stages of Red River or after heavy rains in the drainage basin of the lakes.

The work of removing obstructions now in progress has rendered navigation safer between Jefferson and Mooringsport, and has consequently caused some increase in the quantity of such local navigation.

The opening up of oil wells in this territory has caused a considerable increase in the amount of commerce on this waterway. Its existence has been a great convenience in bringing supplies to the oil-well drillers. There has not been sufficient commerce developed between Jefferson, Tex., and Mooringsport, La., to cause any change in the existing freight rates.

The quarter boat in commission on this stream sank during the fiscal year near the site of the proposed dam at the foot of Caddo Lake, and was sold on April 1, 1912, in its sunken condition. A new quarter boat had in the meantime been constructed at Mooringsport, La., and placed in commission. These quarter boats were employed in removing obstructions to navigation between Jefferson, Tex., and Mooringsport, La.

The amount estimated for maintenance of improvement during the fiscal year ending June 30, 1914, is for continuing the work of cleaning the channel of obstructions to navigation.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Jefferson-Shreveport					1872 [1]	568
					1873 [1]	685
	House	[2] 103	Forty-eighth	Second	1885 [1]	1522
					1890 [1]	1914
					1896 [2]	2065
					1891 [1]	248, 2021
					1904 [1]	387, 2075
	House	[1] 115	Fifty-eighth	Second		
	do	[1] 785	Fifty-ninth	First	1906 [1]	434
	do	[2] 220	Sixtieth	do		
	do	[1] 680	Sixty-first	Second		

[1] No maps.

[2] Contains maps.

July 1, 1911, balance unexpended	$5,904.76
Amount received from sale of condemned property, etc	27.00
	5,931.76

June 30, 1912, amount expended during fiscal year, for maintenance of improvement	$5,574.73
July 1, 1912, balance unexpended	357.03
July 1, 1912, outstanding liabilities	124.56
July 1, 1912, balance available	232.47
Amount appropriated by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	5,232.47
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

(See Appendix U 8.)

9. Improving waterway between Jefferson, Tex., and Shreveport, La., by the construction of a dam at the foot of Caddo Lake.—The waterway from Jefferson, at the head of navigation of Cypress Bayou, to the foot of Caddo Lake is navigable the year round for light-draft boats and with dredging could be made navigable for boats drawing 6 feet. The banks of the bayou are stable, the channel reasonably straight, and, although somewhat obstructed by snags, these are being removed. After leaving Caddo Lake the waterway passes through Big and Little Willow Passes, which have good depths, and spreads out into Soda Lake, which has no navigable depth except during very heavy rises, which do not occur with sufficient frequency or regularity to justify any serious attempts at navigation. From Soda Lake the stream passes over the falls into Twelvemile Bayou and thence into Red River. The falls are working their way upstream and the lower part of Soda Lake has already been drained. After they have eaten through about 2½ miles more they will have entered the passes, where the water is deep, and will at once begin on the foot of Caddo Lake, eventually draining that and destroying all navigation now existing between Jefferson and Mooringsport.

In the report of 1905 a project for a lock and dam at the foot of Caddo Lake, supplemented by extensive dredging, was advanced for the improvement of the waterway. It was proposed to dredge the channel from Red River to the foot of Caddo Lake, giving it a bottom elevation of 164.8 feet above the Cairo datum, giving a depth of 6 feet for eight months in the year, the surface elevation of the water being 170.8. At the foot of Caddo Lake a lock with fixed dam 3,116 feet long was proposed, giving an upper pool surface elevation of 187 feet. The purpose of the proposed lock and dam was to preserve the pool already existing and prevent its being drained by the dredged channel below.

The present project, adopted by the river and harbor act of June 25, 1910, is based upon a report contained in House Document No. 220, Sixtieth Congress, first session, which recommends the construction of a dam as outlined in the report of 1905. The construction of a dam alone, with the necessary bank protection, etc., was therein estimated to cost about $100,000. Such a dam would cut off navigation to Shreveport even in high stages. However, it would be of benefit by preserving the water level, and consequently the navigable channel, in Cypress Bayou and Caddo Lake between Jefferson, Tex., and Mooringsport, La. The said dam is to be so constructed as to admit of a lock when deemed necessary.

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[1] Exclusive of amount available for fiscal year 1913.

The river and harbor act of February 27, 1911, directed an examination and survey for a lock in the proposed dam at the foot of Caddo Lake and a channel from the said dam to Red River by way of Big Pass, Little Pass, Soda Lake, Twelvemile Bayou, and Cross Bayou. Report on this survey was made in accordance with this item by the district officer June 8, 1912, and was unfavorable to the proposed project, but the report has not yet been reviewed by the Board of Engineers for Rivers and Harbors or the Chief of Engineers.

There was expended to June 30, 1912, on the existing project $5,118.14.

During the year a contract was entered into for the construction of the dam at the foot of Caddo Lake, work thereunder being commenced during May, 1912.

For reference to reports of examinations and surveys see Cypress Bayou, Tex. and La.

July 1, 1911, balance unexpended	$96,647.07
June 30, 1912, amount expended during fiscal year, for works of improvement	1,765.21
July 1, 1912, balance unexpended	94,881.86
July 1, 1912, outstanding liabilities	23.49
July 1, 1912, balance available	94,858.37
July 1, 1912, amount covered by uncompleted contracts	81,005.52

(See Appendix U 9.)

10. Red River between Fulton, Ark., and Denison, Tex.—Red River rises in northwest Texas near the New Mexico boundary line, flows slightly south of east approximately 800 miles to Fulton, Ark., thence southeastward to the Mississippi River. Approximate length 1,375 miles. Length of project under Dallas office, from Fulton, Ark., to Denison, Tex., is 290 miles.

This part of the river was originally navigable for small boats during high stages only. The river at low water is a stream from 100 to 200 feet wide in the bends, winding in a shifting channel between banks which are frequently several hundred yards apart. The low-water depth varies from 1.5 to about 4 feet. The banks are covered with trees, constantly caving into the river and forming snags and drifts.

The original appropriation for work above Fulton was made August 5, 1886. The project contemplated improving only high and medium stage navigation by removing snags and drift. Previous to the existing project no work was provided for above the mouth of the Kiamichi River. The amount expended under previous projects is $33,500.

The river and harbor act of March 3, 1905, authorized the improvement of the river between Fulton, Ark., and Denison, Tex. The project contemplates the removal of drift and snags, clearing the banks of timber in danger of caving into the river, and closing chutes and cut-offs where necessary. No estimate of cost has been made.

At the close of the fiscal year ending June 30, 1912, $310,364.52 had been expended on this project, of which amount $10,189.66 was expended on survey of river between Fulton, Ark., and mouth of Washita River, Okla.

During the year the snag boat *C. A. Culberson* and two quarter boats have been engaged in snagging operations. At the close of the year the *C. A. Culberson* was undergoing extraordinary repairs at Fulton, Ark.

The river and harbor act of June 25, 1910, made an appropriation of $50,000 for this portion of the river, and provided that so much of this amount as shall be necessary may, in the discretion of the Secretary of War, be expended for removing snags and other obstructions in the lower 25 miles of the Kiamichi River, a tributary of Red River, in the State of Oklahoma.

A quarter boat entered the Kiamichi River on December 11, 1911, and performed snagging operations on that river from that date until March 15, 1912, when it reentered Red River. The sum of $3,354.07 was expended in this work.

The part of the river over which the *C. A. Culberson* is working at first shows an increasing depth, but that part just above Fulton is now filling with snags and rapidly returning to its original condition.

Beyond the rafting of logs and timber there has been no commerce of any value on this section of the river.

The improvement of this section of the river may have some effect on local freight rates, but no effect on through rates is looked for unless navigation develops on the river below Fulton.

The river and harbor act approved July 25, 1912, adopts the additional project recommended in House Document No. 71, Sixty-first Congress, first session, which contemplates continuing the work now in progress under the existing project, with the addition of a small amount of annual dredging on the worst bars and the closure of certain chutes behind islands; also, by the addition of one small combined dredging and snag boat and one pile driver; the estimated cost of the new plant, including its operation, and also that of the existing plant for the first year being $100,000, for operation of the plant the second year, $60,000, and for future operation $50,000 annually. The act makes an appropriation of $75,000 for continuing improvement and for maintenance in accordance with above project.

The estimate submitted for the fiscal year ending June 30, 1914, is the minimum amount required to keep in operation the existing plant and to place in commission the combined snag boat and dredge contemplated by the new project. Although development of commerce is as yet small, it appears desirable to continue snagging operations to remove the most dangerous obstructions so as to permit of all boat traffic allowable by the natural-channel depths.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Above head of raft to Denison					1879 [1]	986
Above Fulton					1885 [1]	1617 1622
	House	[1] 53	Fifty-sixth	First	1900 [1]	2565
	do	[1] 84	do	Second	1901 [1]	2073
	do	[1] 200	Fifty-eighth	do	1904 [1]	2089
	do	[1] 71	Sixty-first	First	1909 [1]	548
Washita River	do	[1] 209	do	Second	1910 [1]	577
Kiamichi River	do	[1] 212	do	do	1910 [1]	577
Channel connecting Red and Sulphur by way of Texarkana.	do	[1] 12	Sixty-second	First	1911 [1]	622

LOWER KIAMICHI RIVER.

July 1, 1911, balance unexpended	$3, 354. 07
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	3, 354. 07

RED RIVER ABOVE FULTON, ARK.

July 1, 1911, balance unexpended	$45, 986. 64
Amount received account of sales of blue prints	18. 20
	46, 004. 84
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	41, 340. 16
July 1, 1912, balance unexpended	4, 664. 68
July 1, 1912, outstanding liabilities	1, 371. 89
July 1, 1912, balance available	3, 292. 79
Amount appropriated by river and harbor act approved July 25, 1912	75, 000. 00
Amount available for fiscal year ending June 30, 1913	78, 292. 79
Amount (estimated) required to be appropriated for completion of existing project	[2] [3] 25, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2] 42, 000. 00

CONSOLIDATED.

July 1, 1911, balance unexpended	$49, 340. 71
Amount received account of sales of blue prints	18 20
	49, 358. 91
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	44, 694. 23
July 1, 1912, balance unexpended	4, 664. 68
July 1, 1912, outstanding liabilities	1, 371. 89

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[1] No maps.
[2] Exclusive of amount available for fiscal year 1913.
[3] For construction of plant.

July 1, 1912, balance available	$3,292.79
Amount appropriated by river and harbor act approved July 25, 1912	75,000.00
Amount available for fiscal year ending June 30, 1913	78,292.79
Amount (estimated) required to be appropriated for completion of existing project	[1] [2] 25,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 42,000.00

(See Appendix U 10.)

11. Sulphur River, Tex. and Ark.—The Sulphur River rises in northeast Texas, flows easterly approximately 265 miles, and empties into Red River approximately 90 miles below Fulton, Ark.

For the first 17 miles Sulphur River is about 100 feet wide, with very little depth and considerable fall (about 9 feet). The next 40 miles it has a width of 150 to 200 feet with practically no fall, having a minimum depth of about 6 feet. In the next 8 or 10 miles the river rapidly decreases in width and depth until it is impossible to use a skiff except during high water. The stream is badly obstructed by snags and sunken logs.

In 1896 and 1897 the sum of $2,488.99 was expended on snagging operations.

The existing project was adopted by the river and harbor act of March 2, 1907, and contemplates improvement of 150 miles of the river above the Red River by dredging and operation of a snag boat, at an estimated cost of $36,000, assuming that a United States boat is available. Operations during the year consisted in removal of snags and other obstructions by means of a quarter boat.

At the close of the fiscal year June 30, 1912, $39,068.23 had been expended on this project.

Report on the survey ordered by the act of March 3, 1909, was submitted by the district officer during the year. The report was unfavorable.

No estimate for additional appropriation is submitted.

References to examinations or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Sulphur River					1884 [3]	1845
					1896 [3]	2068
	House	[3] 231	Fifty-eighth	Second	1904 [3]	2084
	do	[3] 870	Fifty-ninth	First		
Channel connecting Red and Sulphur Rivers	do	[3] 12	Sixty-second	do		

July 1, 1911, balance unexpended	$12,027.88
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	7,596.11

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[1] Exclusive of amount available for fiscal year 1913.

[2] For construction of plant.

[3] No maps.

July 1, 1912, balance unexpended	$4,431.77
July 1, 1912, outstanding liabilities	86.75
July 1, 1912, balance available	4,345.02

(See Appendix U 11.)

EXAMINATIONS AND SURVEYS REQUIRED BY RIVER AND HARBOR ACTS APPROVED JUNE 25, 1910, AND FEBRUARY 27, 1911.

The local officer was charged with the duty of making preliminary examinations and surveys required by the river and harbor acts approved June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. Sabine River, Tex., as far as practicable above Orange.

2. Red River, from the mouth of the Washita River to the mouth of the Big Washita River, Tex. and Okla.

3. For a lock in the proposed dam at the foot of Caddo Lake, La. and Tex., and a channel from the said dam to the Red River by way of Big Pass, Little Pass, Soda Lake, Twelvemile Bayou, and Cross Bayou.

IMPROVEMENT OF RIVERS AND HARBORS IN THE VICKSBURG, MISS., DISTRICT.

This district was in the charge of Maj. James A. Woodruff, Corps of Engineers; division engineer, Lieut. Col. Charles L. Potter, Corps of Engineers.

1. Red River below Fulton, Ark.—Red River has its source in northwestern Texas and flows in a general easterly direction, forming the boundary between Texas, Oklahoma, and Arkansas. It enters the State of Arkansas about 10 miles north of Texarkana, and from Fulton, Ark., to Shreveport, La., its course changes to a general southerly direction. Below Shreveport its course changes to a general southeasterly direction, and, crossing the State of Louisiana, it enters Mississippi River at Red River Landing. The river is about 1,200 miles long. The section included in the project is 475.4 miles long, extending from Fulton, Ark., to the Atchafalaya River, La., 6.6 miles above the mouth.

The original project was entered upon in the river and harbor act of May 23, 1828, and contemplated improving navigation through or around the great Red River raft. When work commenced the raft was 92 miles long, extending from Loggy Bayou, 65 miles below Shreveport, La., to Hurricane Bluff, 27 miles above. A channel was opened through this obstruction, but owing to failure of appropriations between 1841 and 1852 additional raft formed. In 1857 the agent in charge reported the route opened but not completed, with recommendation for appropriations of $50,000 a year for completion and maintenance. The total amount expended from 1828 to 1857 was $529,831.90. Nothing further was done for 15 years, and in that long interval the results of much of the former work were lost.

When work was resumed, in 1872, the river above Shreveport, La., was closed by a raft 32 miles long, which was growing constantly. Below Shreveport the enlargement of an outlet through Tones Bayou was depleting the main channel and threatening its closure to navigation. At Alexandria, La., the falls were impassable at low stages.

Navigation was difficult and dangerous at all places and at all times. The channel shifted frequently, and at flood the river overflowed the entire raft region. Both above and below Shreveport the bed of the river was a mass of sunken logs and stumps. The banks were heavily timbered and each flood caused them to cave or slide.

The project entered upon by river and harbor act of June 10, 1872, contemplated opening navigation through the raft and closing Tones Bayou outlet. (See S. Doc. No. 29, 42d Cong., 2d sess., and Annual Reports, Chief of Engineers, 1872, p. 569, and 1873, p. 635; contain no maps.) Under the river and harbor act of 1878 the removal of wrecks, snags, and other obstructions below Shreveport was commenced, and the act of 1879 authorized the same kind of work above the raft to Fulton, Ark. Work was carried on under three distinct appropriations until 1882, when it was combined in a general appropriation for continuing the improvement from Fulton, Ark., to the Atchafalaya River, La., with a provision for work at Alexandria, La. The river and harbor acts of 1884 and 1890 contained provisions for closing Sale and Murphy outlet, Louisiana; the acts of 1888, 1892, and 1894 authorized expenditures for improvement of Cypress Bayou, Bayou Dorcheat, and Sulphur River, tributaries of Red River; the act of 1902 provided for improvement of the channel at Shreveport, La.; and the act of 1905 contained a provision for further improvement of the channel at Alexandria, La.

The project was amplified in the river and harbor act of July 13, 1892, to include the systematic clearing of the banks, to remove the source of drift and snags; continuing snagging operations and the removal of jams and raft; dredging tow-heads and shoals; constructing a substantial system of levees to fix the course of the river, either alone or by cooperating with riparian States; the closure of all outlets that deplete the river; the fixing of caving banks to confine the river to the selected channel; and the prevention of injuries to regimen by new cut-offs or outlets. The nature of the improvement requires that it be continued for many years, and no estimate for completion is given on this account. (See Annual Report, Chief of Engineers, 1891, p. 1957.)

There has been no modification since 1892 and the existing project is as stated in the preceding paragraph.

To maintain what has been accomplished and to gradually secure a more stable improvement will require a continuance of work for many years. The estimated cost is $75,000 a year, exclusive of extraordinary demands for new plant that will arise from time to time.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Red River raft [1]					1879	954
Above head of raft to near Denison, Tex.[1]	Senate	42	Forty-fifth	Third	1879	986
Shreveport, La., to Denison, Tex.[1]	do	84	Fifty-sixth	Second	1901	2074

[1] No maps.

References to examination or survey reports and maps or plans not in project documents—Continued.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Tones Bayou, Bayou Pierre, etc.[1]					1879 1883	991 1139
Bayou Pierre route	House	61	Forty-fifth	Third	1879 1885 [2] 1886 1887 1887 1888	991 1487 1343 1446 1453 1886
Falls near Alexandria, La.[1]	Senate	85	Forty-sixth	Second	1875 1880	902 1342
Alexandria, La	House	[2] 462	Fifty-sixth	First	1887 1900	1444 2569
Shreveport, La	do	[2] 196	Forty-ninth	Second	1887 [2] 1893 [2] 1908 1908	1673 1921 1364 1369
Below Shreveport, La.[1]					1878	684
Outlets above Shreveport, La.[1]					1882	1546
Sale and Murphy outlet [1]					1891	1952
Lakes in old raft region above Shreveport, La.[1]					1887	1490
Boyce Landing, La.[1]	House	219	Sixtieth	First		
Fulton, Ark., to the Atchafalaya River, La					1887 1888 1889 1890 1891 [2] 1892 1893 [2] 1894 1894 [2] 1895 [2] 1896 1900 [2] 1902 1909 [2] 1910 [2] 1911 [2]	1446 1337 1591 1830 1974 1594 1921 1430 1439 1360 1563 2459 1446 1549 1697 1843

[1] No maps.

[2] Contains maps.

During the fiscal year ending June 30, 1912, work for maintenance of the improvement was continued as follows: Operations of snag boats, supplemented by those of shore parties during the period of low water, extended over the river between the head of Atchafalaya River, La., and Fulton, Ark. A large number of snags and other obstructions to navigation were removed or destroyed and the river within the limits of the project was kept in safe navigable condition.

A steel hull, self-propelling hydraulic dredge, with 6 pontons and pipe line, was built under contract at Dubuque, Iowa, for maintenance of the improvement by dredging shoal places.

The amount expended from 1872 to the close of the fiscal year ending June 30, 1912, including $5,937.94 derived from sales, was $2,046,919.76, with the following chief results:

The channel cleared through the great raft in 1872–73 opened to navigation 176 miles of river above Shreveport to Fulton. Subsequent work secured the complete removal of the raft, prevented formations of the same nature, increased the width of the river 100 feet or more, and there now flows in the course laid out for it in the old raft region a broad and deep river, safe for navigation at all but the lowest stages. The survey of 1908 showed that the bed of the river in the old raft region above Shreveport had lowered in places as much as 25 feet. Incidentally the removal of the raft drained the fertile valley and reclaimed thousands of acres of productive lands. Tones Bayou outlet is closed by a heavy earthen dam, connected with the line of levee above and below it, and the main channel, for a time called "Little River," widened and scoured until navigation of the stretch became uninterrupted at low stages. All of the chief outlets along the right bank above Tones Bayou to the Arkansas-Louisiana line, 86 miles, have been closed with dams by cooperation with the State of Louisiana and local levee districts. Work at Alexandria Falls rendered them navigable at all stages. The channel was deepened from 2½ to 5½ feet at the lower falls and to 6 feet at the upper falls, lengthening the period of navigation about two months. Persistent snagging operations, repeated from year to year, kept the river opened and enabled steamboats to make regular trips, the river from the Atchafalaya to Fulton ordinarily being open for boats of 3-foot draft at stages about a foot above zero of the Shreveport gauge. The maximum draft that can be carried at mean low water is 3 feet to Montgomery, La., 165 miles above the Atchafalaya; 2½ feet to Shreveport, 300 miles; and 2 feet to Fulton, Ark., 475 miles. The range between low and high water at the several gauge stations is as follows: Fulton, Ark., 35.65 feet; Shreveport, La., 41.2 feet; Alexandria, La., 45.5 feet; and Barbre Landing, La. (head of Atchafalaya River), 52.72 feet. Much of the work performed necessarily has been in repetition from time to time, and the items of improvement and maintenance are so closely allied that the cost of each can not be given separately.

At present steamboats seldom run above Fulton, Ark., but at high stages the river is navigable in fact to Denison, Tex., about 292 miles Fulton, and about 767 miles above the Atchafalaya River.

For more extended information respecting the work performed reference is invited to the report and illustrations at page 1909 of the Report of the Chief of Engineers for 1893 and to the subsequent reports of the district officers.

Notwithstanding the facilities for quick transportation afforded by railways, the commerce of Red River until recent years consisted of large shipments of cotton, cottonseed and its products, lumber, staves, timber, etc., with heavy return freights of general merchandise and plantation supplies.

The commerce and navigation reported for the 18 years ending June 30, 1907, showed great variations, due to the changing crop conditions, occasional periods of extraordinary low water during the busy season, and other causes, ranging in quantity from 66,376 to 279,946 short tons per annum, with estimated values of from $1,506,500 to $9,185,000. The average for the 18 years was 123,244 short tons, valued at $4,359,900. To this should be added the commerce from Ouachita River, entering Red River at the mouth of Black River, the average of which was 178,070 short tons, valued at $6,229,560, making a total of 301,314 short tons, valued at $10,589,460.

In 1908 there was a marked decline of navigation above the mouth of Black River, and the commerce reported in that stretch only amounted to 36,288 short tons, valued at $198,240. In 1909 it amounted to 69,885 short tons, valued at $154,789; in 1910 it amounted to 59,940 short tons, valued at $185,788; and in 1911 it amounted to 48,702 short tons, valued at $152,587.

The project effected a reduction of freight rates on all commodities.

The available funds will be applied to continuing the improvement, payment for construction of dredging plant, and maintenance.

The amount required for expenditure in the fiscal year ending June 30, 1914, will be applied to the operation of snag and dredge boats and further work on the existing approved project. This work is for maintenance and the extension of benefits.

July 1, 1911, balance unexpended	$182, 759. 43
Amount received from sales of property	157. 41
Amount received from overpayments	. 25
	182, 917. 09
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	113, 898. 66
July 1, 1912, balance unexpended	69, 018. 43
July 1, 1912, outstanding liabilities	5, 054. 22
July 1, 1912, balance available	63, 964. 21
Amount appropriated by river and harbor act approved July 25, 1912	50, 000. 00
Amount available for fiscal year ending June 30, 1913	113, 964. 21
July 1, 1912, amount covered by uncompleted contracts	31, 717. 40
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 75, 000. 00

(See Appendix V 1.)

2. Ouachita and Black Rivers, Ark. and La.—Ouachita (the Indian name for "black") River has its source in Polk County, Ark., in the Ouachita Mountains, and, following an irregular course, flows in a general southeasterly direction through Arkansas and Louisiana until joined by Tensas and Little Rivers at Trinity (Jonesville post office), Catahoula Parish, La. Below this junction it is called Black River, and flows in a southerly direction, entering Red River 34 miles above the mouth of the latter stream. Ouachita River is about 500 miles long and Black River is 56.8 miles long. The section included in the project extends from the mouth of Black River upstream to a point 10 miles above Camden, Ark., 360 miles.

The improvement by the United States commenced in 1871. At that time navigation at all stages was much obstructed by snags, logs, wrecks, leaning and sliding trees, etc., and at low stages the greater part of the river was unnavigable by reason of these obstructions and numerous gravel and sand bars.

The project entered upon in the river and harbor act of March 3, 1871, contemplated temporary improvement from Trinity, La., to Arkadelphia, Ark., by removal of snags, etc., and by dredging the worst bars. Under the river and harbor act of June 10, 1872, a project was adopted for locks and dams to give 4 feet depth from Trinity, La., to Camden, Ark., but was abandoned two years later.

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[1] Exclusive of amount available for fiscal year 1913.

The project under which work continued after 1874 contemplated the removal of snags, logs, wrecks, leaning timber, etc., obstructing navigation below Camden, Ark. Black River was added to the project in 1884. The amount expended on the original and modified projects prior to operations under the existing project was $614,802.19.

The existing project was entered upon in the river and harbor act of June 13, 1902, and is based upon the plan set forth in House Document No. 448, Fifty-seventh Congress, first session (Report of the Chief of Engineers 1902, p. 1435), and contemplates construction of eight locks and movable dams to afford a navigable depth of 6½ feet from the mouth of Black River, La., upstream to a point 10 miles above Camden, Ark. Besides a continuation of snagging work for maintenance, Congress has authorized the construction of six locks and movable dams, Nos. 2, 3, 4, 6, 7, and 8. The originally proposed site of Lock and Dam No. 2 was changed, eliminating Lock and Dam No. 1 from the project. (See Report of the Chief of Engineers, 1908, p. 490). Construction of Locks and Dams Nos. 5 and 9 has not yet been authorized. The appropriations made for lock and dam construction amount to $2,040,869 and additional continuing contract authorizations amount to $150,000 for the construction of Locks and Dams Nos. 2, 4, 6, and 8. The first appropriation for Locks and Dams Nos. 3 and 7 was $100,000, the estimated cost being $670,000 for Lock and Dam No. 3 and $634,000 for Lock and Dam No. 7. Continuing-contract provision for the completion of Lock and Dam No. 3, amounting to $620,000, is recommended. The estimated annual cost of snagging work, etc., for maintenance is $25,000.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Rockport, Ark., to Louisiana State line [1]					1871	834
Camden, Ark., to Trinity, La.[1]					1872	867
Do.[1]	House	259	Forty-third	First	1874	852
Camden, Ark., to mouth [1]	Senate	69	Forty-eighth	do.	1884	1386
Do.[1]					1887	1487
Monroe, La.[1]	Senate	69	Forty-eighth	First	1884	1381
Trenton, La.[1]	do	69	do	do	1884	1381
Black River, La.[1]					1884	1363
Catahoula Shoals, La.[1]					1880	1307
Do.[2]					1891	1967
Mouth to head of navigation [1]					1889	1681
Camden, Ark.[1]	House	96	Fifty-sixth	Second	1901	2090
Preliminary report on locks and dams [2]	do	480	do	First	1900	2544
Location of site for proposed storage reservoir [2]	do	588	Sixty-second	Second		

[1] No maps.

[2] Contains maps.

During the fiscal year ending June 30, 1912, snagging work for maintenance extended from the mouth of Black River, La., to Camden, Ark., 350 miles upstream, with greatly beneficial results.

The wreck of a derrick barge was pulled out of the channel near Lock No. 2, Louisiana, December 6, 1911. The owner of the barge reimbursed the United States for the cost of this work, $24.87.

Work at Locks and Dams Nos. 4 and 8 was continued by hired labor, work at Lock and Dam No. 6 partly by contract and partly by hired labor, and work at Lock No. 2 was continued by contract. Details are given in the district officer's report.

The condition of the work of lock and dam construction on June 30, 1912, was about as follows:

Per cent completed on basis of material delivered and work done.

	Per cent.		Per cent.
Lock No. 2	11	Dam No. 6	19
Lock No. 4	97	Lock No. 8	96
Dam No. 4	72	Dam No. 8	98
Lock No. 6	85		

Construction of Locks and Dams Nos. 3 and 7, authorized by the river and harbor act approved July 25, 1912, has not commenced.

Lock and dam construction is in progress under continuing-contract appropriations, the balances of the authorizations remaining to be appropriated being as follows: For Locks and Dams Nos. 2, 4, 6, and 8, $150,000.

By authority of the Secretary of War, a tract of land containing 14.96 acres on the left bank of the river in Caldwell Parish, La., was purchased in April, 1912, at $50 per acre, as a part of the site for the construction and maintenance of Lock and Dam No. 3, near Call Landing, La., and 13.74 acres on the right bank of the river are to be purchased, at the same price per acre, as soon as the title thereto is perfected.

Acquisition of 81.8 acres in Union County and 26.45 acres in Bradley County, Ark., as a site for the construction and maintenance of Lock and Dam No. 7, at Perigeethe Shoals, Ark., also has been authorized and it is believed that action in the matter will be concluded and the transfers made in the near future.

The amount expended under the existing project to June 30, 1912, was $1,803,179.72 (including $2,465.13 derived from sales). Of this amount $11,786.73 has been applied to completion of survey, $199,520.80 to maintenance, and $7,994.60 to surveys and acquiring sites for Locks and Dams Nos. 3 and 7.

Besides the slack-water improvement in progress at Locks and Dams Nos. 2, 4, 6, and 8, the work done has consisted chiefly of the removal of snags, logs, wrecks, leaning timber, tree slides, etc., for the purpose of maintaining navigation, and the improvement of Catahoula Shoals, a rock and gravel bar about 20 miles above Trinity, La., where the available depth at low water was increased from 15 to 40 inches. At moderately high stages, or for six to seven months of the year, New Orleans steamboats ascend the river to Camden, Ark.; at medium stages they run to Monroe, La., but during the periods of low water Harrisonburg, La., 72 miles above Red River, is considered the head of navigation, though small local packets make trips between points on the river above. The maximum draft that can be carried at mean low water is 3½ feet to Harrisonburg, La.; 1¼ feet to Monroe, La.; and 8 inches to Camden, Ark. The range between high and low water at the several gauge stations on Ouachita River is as follows: Camden, Ark., 44.2 feet; Monroe, La., 48.6 feet; Riverton, La., 51.3 feet; and Jonesville, La., 54.1 feet. Camden, Ark., is considered the head of navigation, but at high stages the river is navigable in fact to Arkadelphia, Ark.

The commerce of Ouachita River and its tributaries is considerable and consists of shipments of cotton, cotton seed, lumber, staves, saw logs, and miscellaneous articles, with return freights of general merchandise and plantation supplies. Most of the cotton is shipped to New Orleans, and large quantities of staves for export are sent to that city. The volume of commerce as reported for 22 years, ranges between 57,684 and 313,863 short tons per annum, with values estimated at $357,220 to $10,234,250. The average is 165,389 short tons, valued at $5,561,044. The variations are due to crop yields, the uncertainty of navigation, droughts, and other causes, and the improvement by locks and dams is for an extension of benefits by affording navigation to Camden the year round.

The project has effected a reduction of railroad rates from New Orleans to Monroe, La., and points below meet the steamboat rates. Railroad rates from Monroe, La., to inland towns, as a rule, are greatly in excess of those to points where there is water competition. The benefits to be derived from slack-water navigation will tend to a greater uniformity and larger volume of commerce.

For more extended information respecting this improvement, reference is invited to the report of 1895 (p. 1887) and to subsequent reports of the district officers.

The available funds will be applied to continuing lock and dam construction, to make the improved depths available, and extend the benefits, and to snagging work, etc., for maintenance. The estimates for the fiscal year 1914 are for the same purpose.

July 1, 1911, balance unexpended		$810,359.46
Amount received from sales of property		483.97
Amount received from overpayment		3.25
Amount received from reimbursement of cost of removing wreck		24.87
		810,871.55
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$461,192.82	
For maintenance of improvement	23,298.39	
		484,491.21
July 1, 1912, balance unexpended		326,380.34
July 1, 1912, outstanding liabilities		54,783.35
July 1, 1912, balance available		271,596.99
Amount appropriated by sundry civil act approved Aug. 24, 1912		50,000.00
Amount appropriated by river and harbor act approved July 25, 1912		115,000.00
Amount available for fiscal year ending June 30, 1913		436,596.99
July 1, 1912, amount covered by uncompleted contracts		260,014.97
Amount of continuing contract authorization, act of Feb. 27, 1911		[1]200,000.00

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[1] For Locks and Dams Nos. 2, 4, 6, and 8.

Amount appropriated under such authorization	$50,000.00
Amount yet to be appropriated	150,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 1,354,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1,2] 525,000.00

(See Appendix V 2.)

3. *Ouachita River above Camden to Arkadelphia, Ark.*—(See preceding report for general description of river, source, and flow.) The river and harbor act of March 3, 1871, entered upon a plan for temporary improvement of the river from Arkadelphia, Ark., to Trinity, La. (based upon the report of examination printed in the Report of the Chief of Engineers for 1871, p. 334), but the project was modified in 1874 by discontinuing all work above Camden, Ark.

In 1871 navigation of the stretch of river above Camden to Arkadelphia, estimated distance 90 miles, was obstructed by shoals, snags, logs, leaning timber, etc. There is no record of the amount expended above Camden between 1871 and 1874, as the appropriation was expended for work from Arkadelphia to the Louisiana State line.

In the river and harbor act of August 11, 1888, a project, based upon the plan contained in the Report of the Chief of Engineers for 1887, page 1495, was entered upon for improvement of the river above Camden to Arkadelphia by cutting leaning timber, removing snags and logs, and building brush dams at the shoals. This work was completed in 1890, the sum of $9,000 having been expended for that purpose.

The existing project, which has not been modified since its adoption in the river and harbor act approved June 25, 1910, contemplated the removal of snags, leaning timber, etc., which had accumulated since 1890 and which rendered navigation difficult during the period between December and May, when there generally is sufficient water. (H. Doc. No. 588, 62d Cong., 2d sess., with maps.)

This work was completed during the fiscal year ending June 30, 1912, the amount expended having been $17,389.81. During the fiscal year 1911 operations were carried downstream from Arkadelphia to the mouth of Little Missouri River, about 57 miles, and from Camden upstream 4 miles. Operations during the fiscal year 1912 covered the intervening stretch.

Reference is invited to the report of the district officer for 1891 (Report Chief of Engineers, 1891, p. 1975), in which information respecting former work will be found.

The following references are made to examination or survey reports and maps or plans not in project documents: Reports Chief of Engineers, 1884, page 1351, and 1893, page 2091.

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[1] Exclusive of amount available for fiscal year 1913 for Locks and Dams Nos. 2, 3, 4, 6, 7, and 8.

[2] For Locks and Dams Nos. 2, 4, 6, and 8, $150,000, under continuing-contract authorization made by the river and harbor act of 1911; for Locks and Dams Nos. 3 and 7, $350,000; for open-channel work, $25,000; total, $525,000.

The commerce of this section of the river consists chiefly of floating saw logs to mills downstream. Other commerce is small and has declined in recent years. The work performed has had no effect on freight rates.

It is recommended that maintenance of the work be continued, at a cost of $2,500 per year for three years, or until it is evident that the amount of commerce does not warrant further maintenance.

July 1, 1911, balance unexpended	$6,708.24
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	6,598.05
July 1, 1912, balance unexpended	110.19
July 1, 1912, outstanding liabilities	58.27
July 1, 1912, balance available	51.92
Amount appropriated by river and harbor act approved July 25, 1912	2,500.00
Amount available for fiscal year ending June 30, 1913	2,551.92
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]2,500.00

(See Appendix V 3.)

4. Saline River, Ark.—Saline River has its source in Saline County, Ark., about 30 miles west of Little Rock, flows in a general southerly direction, and enters Ouachita River 96 miles below Camden. It is about 300 miles long. The section included in the project, from the mouth upstream to Turtle Bar, is about 135 miles.

The original condition of this stream before its improvement was undertaken by the United States was such that boats of 100 tons burden could navigate to Godfrey Landing, 10 miles above the mouth, at ordinary low water; to Longview, 38 miles above the mouth, during medium stages; and to Mount Elba, 104 miles above the mouth, at high stages. There was navigation for flatboats between Hurricane Creek and the mouth, 138 miles, during the spring freshets or for about two months of each year. During the periods of low water the stream was unnavigable, the depths in the lower reaches ranging from 1.5 to 2 feet for a boat 12 feet wide, and in the upper reaches being only 6 inches for a boat 8 feet wide. The obstructions during the navigable periods were snags, drift piles, and overhanging timber.

The original project (act of June 14, 1880) contemplated snagging operations for the removal of obstructions between the mouth and Turtle Bar. The amount expended under this project was $21,500. Operations were suspended in December, 1884. This project was based upon a report of examination (without maps) in Report of the Chief of Engineers for 1879, page 1003.

The existing project (act of June 25, 1910, H. Doc. No. 1212, 60th Cong., 2d sess., no maps) is a revival of the old project and contemplates snagging operations for the removal of obstructions which have formed between the mouth and Turtle Bar. The estimated cost was $5,400, with annual charges of $3,000 for maintenance.

Reports of examinations not in project documents were printed in the Annual Reports for 1887, page 1546, and 1893, page 2122. (H. Doc. 236, 52d Cong., 2d sess.) Both reports are without maps.

The amount expended under the existing project to June 30, 1912, was $5,691.67. The work was transferred from the Little Rock, Ark., to the Vicksburg, Miss., district in July, 1910, and the district officer was authorized to defer operations until a suitable snagging outfit could be spared from the work of improving Ouachita River. In the spring of 1911 preparations were made for beginning work, and a light-draft quarter boat fitted out for the purpose was cordelled upstream to the St. Louis, Iron Mountain & Southern Railway bridge near Warren, Ark., about 58 miles above the mouth of the river, where active operations commenced June 20. During the fiscal year 1912 work was carried downstream to a point about 12 miles above the mouth. This work was heavy and the available funds were exhausted in November, 1911.

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[1] Exclusive of amount available for fiscal year 1913.

In January, 1912, complaints were made by navigation interests of obstructions caused by jams of drift, and by authority of the Secretary of War the sum of $500 was allotted March 6, 1912, from the appropriation provided by the river and harbor act of March 3, 1905, for emergency work. The obstructions complained of consisted of one jam and four side jams between 5 and 6 miles above the mouth, which were removed by a snag boat in March, 1912, at a cost of $291.67. The balance of the allotment, $208.33, was returned to the Treasury to the credit of the appropriation.

Rafting and logging are carried on in this stream from points above Mourning Ferry, 145 miles, and barges may be floated in this stretch during periods of high water. The commerce reported in 1911 amounted to 2,000 short tons of saw logs, valued at $6,000. The project has had no effect on freight rates. Mount Elba, 104 miles above the mouth, is considered the head of steamboat navigation at high water, although boats have made occasional trips years ago to Hurricane Creek, 138 miles above the mouth. Godfrey Landing, 10 miles above the mouth, is the head of steamboat navigation at ordinary low water. The range between high and low water is about 28 feet throughout that part of the river in which work is contemplated.

The available funds will be applied to snagging work, etc., in accordance with the existing project. The estimate for maintenance is for continuing the work and for the removal of obstructions added from time to time.

July 1, 1911, balance unexpended		$4,518.84
Amount allotted Mar. 6, 1912, for emergency work, under act of Mar. 3, 1905		500.00
		5,018.84
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	$4,810.51	
Balance of allotment for emergency work returned to Treasury	208.33	
		5,018.84
Amount appropriated by river and harbor act approved July 25, 1912		3,000.00
Amount available for fiscal year ending June 30, 1913		3,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 3,000.00

(See Appendix V 4.)

5. Bayou Bartholomew, Boeuf River, Tensas River and Bayou Maçon, and Bayous D'Arbonne and Corney, La. and Ark.—These streams are tributaries of Ouachita River and are not navigable at low stages. The works were consolidated by the river and harbor act of June 13, 1902. The improvements are all of the same character,

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[1] Exclusive of amount available for fiscal year 1913.

i. e., the removal of snags, wrecks, leaning timber, etc., to lessen the danger and lengthen the period of navigation. Drift, sliding and caving banks, and the rapid growth of vegetation constantly add obstructions.

(*a*) *Bayou Bartholomew, La. and Ark.*—This bayou has its source in Jefferson County, Ark., a few miles west of Pine Bluff; following a tortuous course, it flows first in a southeasterly direction nearly parallel to Arkansas River, then in a southerly direction, parallel to the Mississippi River, and, after entering Louisiana, turns to the southwest and enters Ouachita River in Morehouse Parish, opposite Ouachita, La., 140.5 miles below Camden, Ark. The length of the stream is about 300 miles. The section included in the project, below Baxter, Ark., to the mouth, is 182 miles. Before improvement it was navigable for light boats about three months of the year, but the passageway for steamboats was much obstructed.

The project adopted March 3, 1881, was based on a report of examination printed in Report of the Chief of Engineers for 1879, page 997 (H. Doc. No. 61, 45th Cong., 3d sess., no maps), and contemplated removing obstructions below Baxter to the mouth of the bayou. This project has not been modified, except that the plan for maintenance contemplates work between the mouth and McComb Landing, Ark., the present head of navigation, 41 miles below Baxter, at an estimated cost of about $4,000 a year.

The following references are made to examination or survey reports (without maps), not included in project documents, published in Reports of the Chief of Engineers: From mouth to Arkansas State line, 1872, page 383. From mouth to Baxter, Ark., 1881, page 1453 (H. Doc. No. 38, 46th Cong., 3d sess.). Above Baxter, Ark., to Lincoln County line, 1885, page 1548 (H. Doc. No. 147, 48th Cong., 2d sess., sketch printed in document).

During the fiscal year ending June 30, 1912, work for maintenance of the improvement extended from a point 1 mile above the Louisiana-Arkansas State line downstream 86.7 miles to the mouth of the bayou. A large number of snags, leaning trees, and other obstructions were destroyed, and the stretch worked over was put in good navigable condition for the time.

The amount expended to June 30, 1912, was $73,730.78. The project was practically completed in 1897 to McComb Landing, Ark., the present head of navigation, 141 miles, at a cost of $45,873.53. This work resulted in safer navigation, increased the period to about six months of the year, enabled boats to make trips in half the time formerly required, and reduced freight rates about 50 per cent. There being no demand for navigation above McComb Landing, subsequent expenditures were for maintenance, and $27,857.25 has been applied to that purpose.

A condensed history of the work performed in Bayou Bartholomew will be found in the Report of the Chief of Engineers for 1896, page 1601. Subsequent reports of the district officers refer only to the yearly operations.

The commerce consists of shipments of cotton, cotton seed, staves, saw logs, etc., with return freights of general merchandise and plantation supplies. Much of the trade has been diverted to railroads, as the stages of the bayou frequently are not coincident with the needs of transportation. The commerce for 20 years prior to

1910 ranged between a maximum of 49,299 short tons in 1891 and a minimum of 1,502 short tons in 1907, the average being 11,585 tons, valued at $297,780. No commerce was reported in 1910 or 1911.

There is no record of freight rates on Bayou Bartholomew and the works consolidated with it available for making a comparison of the effect of the improvement. In a general way it may be stated that the rates have been greatly reduced; that traffic is no longer sufficiently lucrative to support the class of boats formerly plying in these streams, but it is now carried by smaller boats. This is largely due to competition of railroads, and boats now ply only where the rivers are the only shipping routes.

The appropriation recommended will be applied to removal of snags, overhanging trees, drift, etc., for maintenance.

July 1, 1911, balance unexpended		$6,527.65
Amount transferred to Boeuf River	$1,269.22	
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	5,258.43	
		6,527.65
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		3,000.00
Amount available for fiscal year ending June 30, 1913		3,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		(1)

(*b*) *Boeuf River, La.*—This river has its source in Chicot County, southeastern Arkansas, flows in a general southwesterly direction, and enters Ouachita River in Catahoula Parish, La., opposite Stafford, and 269.8 miles below Camden, Ark. It is about 300 miles long, and the section included in the project, below Wallace Landing, La., to the mouth, is about 170 miles. Before improvement it was navigable to Point Jefferson, La., 151 miles, but passage was difficult and dangerous on account of overhanging trees and snags and logs in the channel.

The project adopted in the river and harbor act of March 3, 1881, was based on report of an examination printed in Report of the Chief of Engineers for 1881, page 1424 (H. Doc. No. 62, 46th Cong., 3d sess., no maps), and contemplated removing obstructions to afford safe navigation at high stages between the mouth and Wallace Landing.

Under river and harbor act of August 5, 1886, a supplemental project was entered upon for the closure of three outlets near Point Jefferson, to confine the flow to the main channel, based on report of examination printed in Report of the Chief of Engineers for 1885, page 1545 (H. Doc. No. 99, 48th Cong., 2d sess., no maps).

Reference to examination reports (without maps), not in project documents, and contained in the following Reports of the Chief of Engineers: Outlets near Point Jefferson, 1891, page 1986; 1893, page 2016; 1896, page 1608 (with cross sections); and 1907, page 1502. Above Wallace Landing, La., 1895, page 1969 (H. Doc. No. 350, 53d Cong., 3d sess.).

The existing project is for maintenance from the mouth to Wallace Landing, La., at an annual cost of about $5,000.

During the fiscal year ending June 30, 1912, work for maintenance commenced November 16 at the mouth of the river and was carried upstream 72.2 miles to Landerneau, La., where it was discontinued

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[1] See consolidated money statement on p. 768.

December 22, 1911, by high stages. Operations will be resumed and continued upstream as soon as there is a probability of continued low water.

The total expenditure to June 30, 1912, was $76,366.67. The original project was completed in 1896 at a cost of $40,992.84. Since then $29,932.05 (including $27.75 received from sales) has been expended for maintenance. In 1887–8, by uniting with planters whose lands would be protected from overflow, the outlets near Point Jefferson were closed by earthen dams, the proportion of the cost borne by the United States having been $5,441.78.

The work put the stream in safe navigable conditions at stages high enough to permit steamboats to cross the bars and, when completed, enabled them to save 36 hours' time on a trip.

The closure of the outlets gave immediate benefit to navigation by concentrating the flow to the main stream, lengthening the period of navigation, and causing the bars to scour. The dams, however, were destroyed in 1890, during an overflow from Mississippi River, caused by crevasses in the levees near the headwaters of Boeuf River, and funds for their restoration have not been provided.

Navigation is rendered more difficult on account of the outlets at Point Jefferson, and additional interest in the project for again closing them is maintained through the necessity of draining Bayou Lafourche Basin, into which the outlets flow, to permit development of a rich tract of land containing 220,800 acres, much of which has been converted into a swamp and all of which is seriously affected by flood water from Boeuf River.

A condensed history of work performed in Boeuf River will be found in the Report of the Chief of Engineers for 1896, page 1605. Subsequent reports of the district officers refer only to yearly operations for maintenance.

The commerce consists of shipments of cotton, cotton seed, staves, etc., and return freights of general merchandise and plantation supplies, and for 22 years ranges between a maximum of 11,261 short tons in 1897, and a minimum of 545 short tons in 1903, the average being 5,522 short tons, valued at $223,400.

The available funds and the appropriation recommended will be applied to maintenance by the removal of obstructions, including snags, overhanging trees, drift, etc.

July 1, 1911, balance unexpended	$2,987.80
Amount transferred from the allotment for Bayou Bartholomew	1,269.22
	4,257.02
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,426.72
July 1, 1912, balance unexpended	1,830.30
July 1, 1912, outstanding liabilities	412.68
July 1, 1912, balance available	1,417.62
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	4,417.62
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	([1])

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[1] See consolidated money statement on p. 768.

(*c*) *Tensas River and Bayou Maçon, La.*—Tensas River has its source in Lake Providence, in northeastern Louisiana, within 2 miles of the Mississippi River, flows in a general southerly direction, gradually diverging from the Mississippi, and joins with the Ouachita and Little Rivers at Trinity, La., 294 miles below Camden, Ark., in forming Black River. It is about 235 miles long. The section included in the project extends from the mouth upstream to Dallas, La., 138 miles.

Bayou Maçon has its source in Desha County, Ark., near the source of Boeuf River, and a few miles west of the Mississippi River, flows in a general southerly direction west of and nearly parallel to Tensas River and enters that stream 42.7 miles above its mouth. Bayou Maçon is about 270 miles long. The section included in the project extends from the mouth upstream to Floyd, La., 112 miles.

Before improvement these streams were navigable at high stages, but the passage of steamboats was difficult and dangerous on account of leaning trees and numerous snags, logs, stumps, etc., in the channel.

The project adopted in the river and harbor act of March 3, 1881, was based upon a report of examination (without maps) printed in the Report of the Chief of Engineers for 1881, page 1457 (H. Doc. No. 62, 46th Cong., 3d sess.), and contemplated removing obstructions in Tensas River from its mouth to Dallas, La.

Bayou Maçon was united with the improvement of Tensas River by river and harbor act of July 5, 1884, the project for this addition having been based upon a report of examination (without maps) printed in the Report of the Chief of Engineers for 1881, page 1462 (H. Doc. No. 62, 46th Cong., 3d sess.), and contemplating the removal of obstructions from its mouth to Floyd, La.

A report of examination of Bayou Maçon above Floyd, La., without maps, not included in project documents, was printed in the Report of the Chief of Engineers for 1895, page 1974 (H. Doc. No. 349, 53d Cong., 3d sess.).

The existing project is for maintenance of the improvement of Tensas River from its mouth to Westwood Place, 81 miles, and Bayou Maçon below Floyd, at an annual cost of about $6,000.

Work for maintenance of the improvements was not resumed during the fiscal year ending June 30, 1912. The expenditure of $8.35 was for traveling expenses incident to inspection of the work.

The total expenditure to June 30, 1912, was $68,604.69. The project for Tensas River was completed in 1898 to Westwood Place, 81 miles above the mouth, the present head of navigation, at a cost of $11,947.02, and the project for Bayou Maçon to Floyd was completed in 1899 at a cost of $23,915.42. The sum of $32,742.25, including $27.75 derived from sales, has been expended for maintenance. Lane Ferry, about 20 miles above Floyd, is the head of navigation in Bayou Maçon. The work put the two streams in fairly good navigable condition at medium and high stages. Upper Tensas River above Westwood Place practically is unnavigable by reason of leaning timber and obstructions in the channel, and there has been no recent effort to induce a resettlement of the abandoned plantations along its banks or to secure a continuance of the improvement to Dallas.

A condensed history of work performed in Tensas River and Bayou Maçon will be found in the Report of the Chief of Engineers for 1895, page 1923. Subsequent reports of the district officers refer only to yearly operations.

The commerce consists chiefly of shipments of cotton, cotton seed, staves, etc., and return freights of plantation supplies. In 22 years it has ranged between a maximum of 29,957 short tons in 1905 and a minimum of 2,649 short tons in 1893, the average being 13,907 short tons, valued at $567,200.

It is proposed to apply the available funds and the appropriation recommended to the removal of snags, overhanging trees, drift, etc., for maintenance.

July 1, 1911, balance unexpended	$931.41
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	8.35
July 1, 1912, balance unexpended	923.06
July 1, 1912, outstanding liabilities	175.00
July 1, 1912, balance available	748.06
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	3,748.06
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

(*d*) *Bayous D'Arbonne and Corney, La.*—Bayou D'Arbonne is formed by the junction of the south, middle, and north, or Corney, branches near Farmerville, Union Parish, northern Louisiana, flows in a southeasterly direction and enters Ouachita River 6 miles above Monroe, La., and 161.7 miles below Camden, Ark. Its length is 37.7 miles.

Bayou Corney is a small creek, has its source in Claiborne Parish, La., and flows in a southeasterly direction. Cobb Landing, La., the head of navigation, is 19.3 miles above its mouth. Stein Bluff is 2.8 miles above its mouth. The creek is about 76 miles in length.

Little D'Arbonne, the south branch, also is a small creek, has its source near Homer, Claiborne Parish, La., and flows in an easterly direction. It is about 56 miles long.

The project entered upon in the river and harbor act of July 5, 1884, was based upon reports of examination and survey (without maps) printed in the Report of the Chief of Engineers for 1884, pages 1372 and 1376 (S. Doc. No. 69, 48th Cong., 1st sess.), and contemplated removing obstructions between the mouth of Bayou D'Arbonne and Stein Bluff on Bayou Corney, 40.5 miles upstream. The river and harbor act of July 13, 1892, authorized an extension of the work 16.5 miles up the Corney branch to Cobb Landing. The river and harbor act of August 17, 1894, directed that $1,000 should be expended in removing obstructions from the Little D'Arbonne.

The existing project is for maintenance of the improvement below Cobb Landing, at an estimated annual cost of about $2,000.

During the fiscal year ending June 30, 1912, the limited balance of the allotment for these streams was expended for the removal of

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[1] See consolidated money statement on p. 768.

obstructions in Bayou D'Arbonne between its mouth and Bayou Choudrant, 7.6 miles upstream.

The amount expended to June 30, 1912, was $29,600 and resulted in greater safety to navigation. The work practically was completed in 1896 at a cost of $18,000. Subsequent expenditures for maintenance have amounted to $10,600, and $1,000 was expended for improving Little D'Arbonne Branch.

A condensed history of previous work will be found in the Report of the Chief of Engineers for 1895, page 1914.

The commerce consists of shipments of cotton, cotton seed, etc., and return freights of plantation supplies. It varies considerably, and during 16 years ranged between a maximum of 104,691 short tons in 1911 and a minimum of 682 short tons in 1903, the average being 16,160 tons, valued at $291,300.

The appropriation recommended will be applied to removal of obstructions, including snags, overhanging trees, drift, etc., for maintenance and extension of benefits.

July 1, 1911, balance unexpended	$352.62
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	352.62
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	3,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

CONSOLIDATED.

July 1, 1911, balance unexpended	$10,799.48
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	8,046.12
July 1, 1912, balance unexpended	2,753.36
July 1, 1912, outstanding liabilities	587.68
July 1, 1912, balance available	2,165.68
Amount appropriated by river and harbor act approved July 25, 1912	12,000.00
Amount available for fiscal year ending June 30, 1913	14,165.68
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2] 16,000.00

(See Appendix V 5.)

6. *Mouth of Yazoo River and Harbor at Vicksburg, Miss.*—The shifting bar at the former mouth of the Yazoo was the most serious obstruction to navigation of that river and its tributaries, a system comprising about 800 miles of navigable waterways. At low stages steamboats were prevented from entering or leaving the river without lightering their cargoes across the bar, and it frequently happened that the outlet was entirely closed to navigation throughout the busiest season of the year.

Prior to 1876 the city of Vicksburg possessed the most commanding site and the finest harbor on the Mississippi River. There was deep water along the city front, and the entire width of the river was available for steamboats at all stages, with not less than 25 feet

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[1] See consolidated money statement on this page.
[2] Exclusive of amount available for fiscal year 1913.

depth in any part of the harbor. The cut-off of April 27, 1876, and subsequent shoaling of the old channel from the river to the front of the city practically destroyed the harbor, which became unnavigable except at high stages.

The original project for improving Vicksburg Harbor was entered upon under the river and harbor act of June 18, 1878. The first work consisted of revetting the rapidly caving bank at Delta Point, La., opposite Vicksburg, the continued recession of which was increasing the distance from the harbor to the river channel. The river and harbor act of August 2, 1882, placed the work under the Mississippi River Commission, and the revetment at Delta Point was continued. The amount expended at Delta Point was $389,486.08.

When Vicksburg Harbor was placed under the Mississippi River Commission in 1882 a project was adopted for dredging a basin 1,700 feet long by 300 feet wide in front of the city, with a canal 150 feet wide to connect it with the river. Dredging under this project amounted to 250,035 cubic yards in 1883, when discontinued. It was resumed in 1888, under a slightly modified project, and continued until 1893. During the latter period the dredging amounted to 1,729,994 cubic yards, making a total of 2,080,029 cubic yards of excavation. In 1888 pile dikes were built at the north end of the basin and along the west side of the canal, aggregating 6,800 feet in length. The expenditures for Vicksburg Harbor were $442,724.77, which, added to the amount expended at Delta Point, makes a total of $832,210.85. The improvement of Vicksburg Harbor was transferred to the Engineer Department under a provision of the river and harbor act of August 18, 1894.

The project, adopted by Congress in the river and harbor act of July 13, 1892 (Report of the Chief of Engineers for 1892, p. 1627, H. Doc. No. 125, 52d Cong., 1st sess., maps not printed), contemplated opening a new mouth or outlet for Yazoo River from its original mouth on Old River (9.8 miles above the former outlet to the Mississippi) through deep water down the wrong end of Old River, thence across a neck of low land between Old River and Lake Centennial, and around the head of De Soto Island and down the east arm of Lake Centennial to the Mississippi River, entering it upon the channel side at Kleinston Landing.

Lake Centennial is the old bend of the Mississippi River cut off in 1876, and De Soto Island, prior to the cut-off, was the Louisiana Peninsula around which the river flowed. Vicksburg Harbor is that part of the river along the city front of Vicksburg. The distance from head of the main cut to Kleinston Landing is 6.3 miles. Dredging operations have extended above the head of the main cut up Old River 0.9 mile. The original estimate of cost—$1,500,000—was revised in 1893 and reduced to $1,200,000. (See Report of the Chief of Engineers, 1893, p. 2032, with map.)

Details of the work performed at Delta Point are given in the Annual Reports of the Chief of Engineers for 1879, page 974; 1880, page 1333; 1881, page 1384; 1882, page 1502; 1883, page 2290; 1884, page 2820; 1885, pages 2787 and 2964; 1889, page 2709; 1893, page 3754; 1894, page 2921; 1898, page 3373; 1900, page 4827; and 1902 (supplement), page 110. Maps accompany the reports for 1883, 1884, 1888, 1889, 1893, and 1900.

Details of the work performed by the Mississippi River Commission in Vicksburg Harbor are given in the Annual Reports of the Chief of Engineers for 1884, page 2821; 1888, page 2282; 1889, page 2710; 1890, page 3234; 1891, page 3628; 1892, page 3180; 1893, page 3754; 1894, page 2921; and 1897, page 3728. Maps of the harbor accompany the reports for 1878 (p. 644), 1883, 1884, 1888, 1889, 1890, and 1893.

Details of the work performed under the project for diverting the mouth of Yazoo River, etc., will be found in the Annual Reports of the Chief of Engineers for 1893, page 2029; 1894, page 1488; 1895, page 1933; 1896, page 1618; 1897, page 1927, 1898, page 1625; 1899, page 2015; 1900, page 2524; 1901, page 2052; 1902, page 1420; 1903, page 1385; 1904, page 2050; and 1905, page 1543. Maps accompany the reports for 1893, 1894, 1901, and 1902. Fifteen photographs were printed in the report of 1900.

Reference is invited to the report of an examination and survey of Mississippi River near Vicksburg, with a view to preventing the threatened cut-off, House Executive Document No. 4, Forty-second Congress, first session, and report of a board of engineers upon subject of preservation of the water front of Vicksburg, with maps and estimates, Report of the Chief of Engineers, 1878, page 638.

The existing project is for maintenance, and the cost has varied between $2,500 and $22,000 a year, the average cost being about $6,000 per year.

During the fiscal year ending June 30, 1912, operations for maintenance consisted of dredging in Old River above the head of the main cut and in Lake Centennial below mouth of the main cut. In Old River a cut 1,000 feet long, 80 feet wide, and from 8 to 9 feet deep was made, requiring the removal of about 12,600 cubic yards of material (bucket measurement). By this dredging the low-water depth was increased from 2.5 feet to 4.5 feet, and, after its completion, August 5, 1911, boats experienced no trouble at the locality. In Lake Centennial a cut was made 800 feet long, 40 feet wide, and from 3 to 7 feet deep, from which 8,800 cubic yards of material (bucket measurement) were removed. This work was stopped by a rise of the river September 21, 1911, but will be resumed and extended during the approaching period of low water.

The project was completed in 1905, at a cost of $1,179,210.87. Subsequent expenditures for maintenance amount to $54,432.94. The new outlet was opened in the spring of 1903. Uninterrupted navigation of Vicksburg Harbor has been maintained for nine years, and the new mouth of Yazoo River has been open to boats of 6 feet draft at mean low water. The extreme range between high and low water at Vicksburg is 59 feet, but the usual variation is about 45.3 feet.

The chief features of this work were the purchase of 1,155.54 acres of land for right of way of the main cut from Old River to Lake Centennial; the clearing and grubbing of the entire route; the excavation by dredging of 6,229,281 cubic yards of earth in opening the new outlet, of which about 934,000 cubic yards was used for building a dam, above ordinary low water, across the west arm of Lake Centennial from mouth of the main cut to head of De Soto Island, and constructing a levee containing 429,677 cubic yards from mouth of the canal at Kleinston westward along West Pass bar (which separates the west arm of Lake Centennial from Mississippi River) to within about 4,500 feet of King Point.

The annual commerce of Yazoo River, its tributaries, and Vicksburg Harbor, as reported for seven years, varied between 222,792 and 441,765 tons, the estimated values of which ranged from $6,801,000 to $13,272,000 per annum. The average of the commerce was 321,594 tons per annum, and the average value $8,753,650.

The effect of the project, in conjunction with the work performed in Yazoo River and tributaries, has been to reduce freight rates, as follows: Cotton, about 50 per cent; cotton seed, about 33⅓ per cent; live stock, about 66⅔ per cent; and grain, flour, meal, and provisions, from about 33⅓ to 40 per cent. Rates to inland points, where there is no water competition, indicate that existing freight rates would advance materially if navigation was permanently suspended.

The available balance will be applied to work for maintenance of the improvement by dredging and for repairs and protection of West Pass Levee, etc. The additional appropriation recommended for the fiscal year 1914 will be required for maintenance of the work. A survey made in 1911 along the Mississippi River front of West Pass Levee indicated that revetment of the river bank would be required to stop caving at that locality. Continued disturbance of the regimen of the Mississippi River above Vicksburg will necessitate the construction of this revetment to prevent the destruction of the West Pass Levee and consequent loss of the improvement attained at great cost. The estimated cost of the revetment is $120,000, and $10,000 additional should be provided for dredging, etc., required in Old River and Lake Centennial.

July 1, 1911, balance unexpended	$24, 571. 59
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	10, 215. 40
July 1, 1912, balance unexpended	14, 356. 19
July 1, 1912, outstanding liabilities	1, 790. 71
July 1, 1912, balance available	12, 565. 48
Amount appropriated by river and harbor act approved July 25, 1912	5, 000. 00
Amount available for fiscal year ending June 30, 1913	17, 565. 48
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]130, 000. 00

(See Appendix V 6.)

7. Yazoo, Tallahatchie, Coldwater, and Big Sunflower Rivers, Tchula Lake, Steele and Washington Bayous, and Lake Washington, and Bear Creek, Miss.—Yazoo River and its tributaries were consolidated by river and harbor act of June 13, 1902. The same kind of work is required in all, i. e., the removal of wrecks, snags, stumps, tree slides, sunken logs, leaning timber, etc., for maintenance of navigation.

(*a*) *Yazoo River.*—Yazoo River, about 178 miles long, is formed by the junction of Tallahatchie and Yalobusha Rivers, in Leflore

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[1] Exclusive of amount available for fiscal year 1913.

County, Miss., flows first in a general southerly and then in a southwesterly direction, and enters the Mississippi River at Vicksburg.

Before improvement the period of navigation was limited to high stages on which steamboats could pass the wrecks of gunboats, steamers, and raft sunk to bar navigation during the Civil War. The channel was much obstructed also by snags, stumps, tree slides, leaning timber, etc.

The project entered upon in the river and harbor act of March 3, 1873, contemplated removing the obstructions to give ease and safety to navigation. Subsequent acts of Congress provided for continuing the improvement and for maintenance. The project was based upon reports of examinations published in Reports of the Chief of Engineers for 1873, page 483, and 1874, page 365 (without maps). It has not been modified. There is no practical distinction between improvement and maintenance, as floods, sliding and caving banks, and the rapid growth of vegetation along alluvial streams of this kind constantly add obstructions and render a continuance of snagging operations necessary in the interest of safe and uninterrupted navigation. The estimated cost of this work is about $15,000 a year.

During the fiscal year ending June 30, 1912, snagging operations for maintenance extended over the river from mouth to head and kept it in good navigable condition.

The wreck of the steamer *Mary H. Miller* at lower end of Whites Bar, near Yazoo City, was removed by a snag boat November 18–20, 1911. The cost of this work, $64.87, was reimbursed the United States by the owner of the wreck, under section 20 of the river and harbor act approved March 3, 1899.

The total expenditure to June 30, 1912 (including $618.98 derived from sales) was $445,342.39, which has resulted in safe and uninterrupted navigation from mouth to head of the river the year round. Steamboats of 3½ feet draft navigate the river at mean low water without serious difficulty.

The chief shipments of Yazoo River and tributaries are cotton, cotton seed, staves, timber, etc., with return freights of general merchandise and plantation supplies. The commerce of 21 years ranges between 102,098 and 544,503 short tons annually, with values estimated at $2,840,000 to $9,198,000, the average being 254,869 short tons, valued at $5,706,763.

Freight rates on cotton by boat are about 50 per cent less than by rail; on cotton seed about 33⅓ per cent less. Livestock shipments by boat cost about one-third of the railroad rates, and grain, flour, meal, and provisions shipped by boat cost about 50 per cent less than by rail. To inland points the railroad rates are largely in excess of boat rates for the same distance. Large quantities of timber are rafted which could not be reached by rail.

The range between high and low water at Yazoo City is 40.8 feet.

It is proposed to apply the available funds to continuing work for maintenance of the improvement.

The amount required for expenditure in the fiscal year ending June 30, 1914, will be applied to removal of snags, overhanging trees, drift, etc., and operation of snag and dredge boats, for maintenance and extension of benefits.

July 1, 1911, balance unexpended		$17,241.06
Reimbursement of cost of removing wreck		64.87
		17,305.93
Amount transferred to Big Sunflower River	$4,000.00	
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	8,750.83	
		12,750.83
July 1, 1912, balance unexpended		4,555.10
July 1, 1912, outstanding liabilities		223.80
July 1, 1912, balance available		4,331.30
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		7,000.00
Amount available for fiscal year ending June 30, 1913		11,331.30
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		(1)

(*b*) *Tallahatchie and Coldwater Rivers.*—Tallahatchie River has its source in Tippah County, northern Mississippi, flows in a general southwesterly direction until joined by Coldwater River in Quitman County, and then in a southerly direction, uniting with the Yalobusha, a few miles above Greenwood, in forming Yazoo River. It is about 230 miles long. The section included in this project, from its mouth upstream to the mouth of Coldwater River, is about 121 miles.

Coldwater River has its source in Marshall County, northern Mississippi, flows southwesterly and then southerly to its junction with the Tallahatchie. It is about 125 miles long. The section included in this project, from its mouth upstream to Yazoo Pass, is about 40 miles.

Before improvement Tallahatchie River was navigable to Sharkey, about 65 miles above its mouth, for six months of the year, but passage was difficult and dangerous on account of the number of obstructions in the channel and along the banks and the wreck of the ocean steamship *Star of the West*, sunk February, 1863, 8 miles above the mouth. Above Sharkey the growth of leaning timber was so dense and the channel so obstructed by snags, etc., that that part of the stream practically was unnavigable. The same conditions continued up the Coldwater River.

The project entered upon in the river and harbor act of March 3, 1879, contemplated removing obstructions in Tallahatchie River between its mouth and the mouth of Coldwater River and up the Coldwater to Yazoo Pass. This project is based upon a report of examination (without maps) published in the Report of the Chief of Engineers for 1879, page 982, (S. Doc. No. 42, 45th Cong., 3d sess.). Work in Coldwater was abandoned in 1881, (Report, Chief of Engineers, 1881, p. 1413), but was resumed under a provision of the river and harbor act of March 3, 1905.

References to examination reports (without maps) not in project documents: Reports, Chief of Engineers, 1880, page 1322, and 1897, page 1943 (H. Doc. No. 121, 54th Cong., 2d sess.).

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[1] See consolidated money statement on p. 780.

The existing project is for maintenance of the improvement from Yazoo Pass on the Coldwater to the mouth of Tallahatchie River at a cost of about $10,000 a year.

During the fiscal year ending June 30, 1912, operations for maintenance extended from the mouth of Tallahatchie River upstream about 90 miles. A large number of snags, leaning trees, and other obstructions were destroyed, and the stretch worked over was placed in reasonably safe condition for navigation for the time.

The amount expended to June 30, 1912 (including $40 derived from sales), was $107,946.35, and the work performed permits steamboats of 3 feet draft to run to Sharkey the year round and into Coldwater River at moderately high stages.

A résumé of the work performed in Tallahatchie River is contained in the Report of the Chief of Engineers for 1896, page 1626, and of the work performed in Coldwater River in the report for 1885, page 1518. Subsequent reports of the district officers give each year's operations only.

Marks, on Coldwater River, is considered the present head of navigation, and boats rarely run above that place.

The commerce of 1911 consisted of 40,642 short tons, chiefly cotton seed, saw logs, grain, and cotton, valued at $1,914,716. For statement of effect of project on freight rates, see Yazoo River report preceding.

The commerce of Coldwater River is of little importance and is decreasing.

The estimate for the fiscal year 1914 is for maintenance and extension of benefits.

July 1, 1911, balance unexpended	$9,178.98
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	9,178.98
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	8,000.00
Amount available for fiscal year ending June 30, 1913	8,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

(*c*) *Tallahatchie River above mouth of Coldwater River to Batesville.*—To comply with requirements of river and harbor acts of 1880, 1881, and 1882, a total expenditure of $10,000 was made to clear this stretch of about 45 miles of leaning trees, stumps, and snags, after which work was discontinued by the United States.

The existing project entered upon March 2, 1907, contemplated an expenditure of $2,000 a year for a series of years to put the river in such condition that boats plying the lower Tallahatchie River could safely run to Batesville for five to seven months of the year, eventually the cost of maintenance to be reduced to $1,000 per year. (H. Doc. No. 147, 59th Cong., 1st sess.)

References to examination reports (without maps) not in project documents: Reports Chief of Engineers 1879, page 985, and 1904, page 2088 (H. Doc. No. 190, 58th Cong., 2d sess.).

Work was not resumed during the fiscal year ending June 30, 1912, the available plant being employed elsewhere in the district

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[1] See consolidated money statement on p. 780.

during the period of low water. During the high-water season expenditures were made for repairs of plants preparatory to resuming operations for maintenance when a favorable stage is reached.

The total amount expended to June 30, 1912, was $18,597.38, of which $8,597.38 was applied to maintenance under the existing project. The work was resumed in May, 1907, after a lapse of 25 years and was continued downstream to the mouth of Coldwater River. The chief obstructions to navigation were removed and the stretch placed in fairly good navigable condition.

The commerce is of little importance and decreasing. The available balance will be expended for maintenance.

July 1, 1911, balance unexpended	$1,500.00
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	124.95
July 1, 1912, balance unexpended	1,375.05
July 1, 1912, outstanding liabilities	903.42
July 1, 1912, balance available	471.63

(*d*) *Big Sunflower River.*—This river has its source in Mud Lake, Coahoma County, Miss., near Friar Point, flows in a general southerly direction, and enters Yazoo River about 45 miles above its mouth. It is about 216 miles long. The section included in the project, below the mouth of Hushpuckena River to Yazoo River, is 171.2 miles.

Before improvement the river was navigable about six months of the year, but was obstructed by snags, logs, sand bars, and shoals; navigation was impeded by leaning timber, and at many places the channel was so choked with obstructions and so narrow that it afforded passage for the smallest craft only.

The project entered upon in the river and harbor act of March 3, 1879, was based upon the report of an examination (without maps) published in the Report of the Chief of Engineers for 1879, page 982 (S. Doc. No. 42, 45th Cong., 3d sess.), and contemplated the removal of obstructions between the mouth and Clarksdale, about 196 miles, and the building of inexpensive pile and brush wing dams to scour depths of about 40 inches at the bars. Prior to the building of the Mississippi River levees, and since, when crevasses in the levees occurred, this stream carried large quantities of overflow water and its section was increased thereby. In this enlarged bed the normal river at low stages now flows between secondary banks and, as a rule, the main banks are not overtopped by floods, except near the mouth, where the flood height is affected by backwater from the Mississippi.

On account of the changed conditions, the river and harbor act of March 2, 1907, placed the upper limit of improvement at the mouth of Hushpuckena River, about 25 miles below Clarksdale; authorized a continuation of the work of removing obstructions below that point and an improvement of the lower section below Baird, 97 miles, with a view to obtaining a navigable depth of 3 feet by means of the closure of outlets and more extensive contraction works. The estimates of cost for work below Baird were $75,000 for the necessary closing dams, about $10,000 per year for five years for continuation of the open-river work, and $5,000 per year thereafter. (H. Doc. No. 667, 59th Cong., 1st sess., without maps.) This was the existing project at close of the fiscal year ending June 30, 1912.

Reference is made to the report of an examination (without maps), not in project documents, contained in the Reports of the Chief of Engineers for 1896, page 1638 (S. Doc. No. 245, 54th Cong., 1st sess.), and 1899, page 362.

The project, adopted by the river and harbor act approved July 25, 1912, is based on examination and survey reports and the plans contained in House Document No. 1251, Sixtieth Congress, second session, and House River and Harbor Committee Document No. 2, Sixty-second Congress, second session (maps not printed), which contemplate the construction of a lock and dam at the foot of Hollywood Bar, 74 miles above the mouth of the river, at an estimated cost of $300,000; open-channel work and dredging below the mouth of Hushpuckena River, at an estimated cost of $50,000. The act makes an appropriation of $75,000 for the lock and dam. A continuing-contract provision for the balance of $225,000 for the lock and dam is recommended.

The amount that can profitably be expended during the fiscal year ending June 30, 1914, in addition to available funds, is $120,000 for the lock and dam and $10,000 for open-channel work and dredging from the mouth of the river to the proposed site of the lock and dam.

During the fiscal year ending June 30, 1912, operations for maintenance were continued as follows: Snagging work and the construction and repair of wing dams for maintenance extended over a stretch of 52 miles, between Vick Landing, 6 miles below Baird, and Holland Landing, 39 miles above the mouth, putting it in safe navigable condition for the time. Dredging in the lower 66 miles of the river, between its mouth and Osceola Bar, was continued. Three cuts were made, at One Mile Crossing, Callao Landing, and below Osceola Bar, 45 feet wide, 4½ feet deep, aggregating 2,325 feet in length, from which 8,600 cubic yards of material (bucket measurement) were removed.

The amount expended to June 30, 1912, was $223,543.82. The cutting of leaning timber, removal of channel obstructions, and the building and renewal of wing dams at the bars maintained navigation. The chutes in lower Big Suflower River were closed by levee embankments in 1908–9. The maximum draft at low water that could be carried June 30, 1912, in the stretch of river from just below the mouth of Hushpuckena River to Woodburn, 84 miles above the mouth, was 2 feet. Below Woodburn to the mouth of the river the depth had been increased from 30 inches to 3 feet by the closure of outlets, construction of wing dams, and dredging.

A résumé of the work performed was given in the Report of the Chief of Engineers for 1896, page 1630. Subsequent reports of the district officers contain each year's operations only.

The mouth of Hushpuckena River is considered the head of navigation.

There is quite a large and valuable commerce of cotton, cotton seed, lumber, live stock, saw logs, etc., with return freights of general merchandise and plantation supplies, amounting in 1911 to 92,468 short tons, valued at $1,170,059. This extends upstream as far as navigation is practicable, and is increasing, as about 95 per cent of the land bodering the river is under cultivation.

Freight rates are much higher by rail than by water, and it is believed that the extension of continuous navigation to the mouth of the Hushpuckena will result in material benefits.

It is proposed to apply the available funds pertaining to project of 1879, with modifications, to a continuance of snagging and dredging operations, building and repair of wing dams, etc., to maintain the improvement accomplished and extend its benefits.

PROJECT OF 1879 (OPEN-CHANNEL WORK).

July 1, 1911, balance unexpended	$8,859.70
Amount transferred from allotment for Yazoo River	4,000.00
Amount received from sales of property	93.82
	12,953.52
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	11,538.01
July 1, 1912, balance unexpended	1,415.51
July 1, 1912, outstanding liabilities	438.14
July 1, 1912, balance available	977.37
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	7,500.00
Amount available for fiscal year ending June 30, 1913	8,477.37
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	([1])

PROJECT OF 1912 (LOCK AND DAM).

Amount appropriated by river and harbor act approved July 25, 1912	$75,000.00
Amount available for fiscal year ending June 30, 1913	75,000.00
Amount (estimated) required to be appropriated for completion of existing project	[2]275,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[2]120,000.00

CONSOLIDATED.

July 1, 1911, balance unexpended	$8,859.70
Amount transferred from allotment for Yazo River	4,000.00
Amount received from sales	93.82
	12,953.52
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	11,538.01
July 1, 1912, balance unexpended	1,415.51
July 1, 1912, outstanding liabilities	438.14
July 1, 1912, balance available	977.37
Amount appropriated by river and harbor act approved July 25, 1912	82,500.00
Amount available for fiscal year ending June 30, 1913	83,477.37
Amount (estimated) required to be appropriated for completion of existing project	[2]275,000.00

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[1] See consolidated money statement on p. 780.

[2] Exclusive of amount available for fiscal year 1913.

Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	[1] $120,000.00
For maintenance of improvement	(2)
Total	[1] 120,000.00

(*e*) *Tchula Lake.*—This is an arm of Yazoo River, about 60 miles long, and east of Honey Island, in Holmes County, Miss. Before improvement navigation was obstructed its entire length by a network of snags in the channel and by heavy leaning timber and a thick growth of brush along both banks.

The project adopted in the river and harbor act of March 3, 1881, was based upon a report of examination (without maps) published in the Report of the Chief of Engineers for 1880, page 1350 (S Doc. No. 35, 46th Cong., 2d sess.), and contemplated removal of the obstructions to prolong the period of navigation and to permit light-draft steamboats to pass through the lake earlier in the cotton season. The work was completed in 1896 (Report Chief of Engineers, 1895, p. 1942) when operations were discontinued. The river and harbor act of June 13, 1902, and subsequent acts contained provisions for maintenance.

During the fiscal year ending June 30, 1912, operations for maintenance extended from the head of the lake downstream about 36 miles to Black Creek.

The work was practically completed and the stream put in safe navigable condition in 1896 at an expenditure of $21,000. Since 1902, $15,305.98 has been expended for maintenance. The total amount expended to June 30, 1912, was $36,305.98.

The commerce is limited and is not increasing. In 1911 it amounted to 564 short tons of cotton, cotton seed, live stock, and provisions, valued at $60,500.

Water rates of transportation are lower than by rail.

The available funds and the additional amount recommended for expenditure in the fiscal year 1914 are to be applied to continuing snagging work for maintenance.

July 1, 1911, balance unexpended	$2,000.00
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,419.25
July 1, 1912, balance unexpended	580.75
July 1, 1912, outstanding liabilities	207.44
July 1, 1912, balance available	373.31
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(2)

(*f*) *Steele and Washington Bayous and Lake Washington.*—Steele Bayou has its source in Swan Lake, Washington County, Miss., flows in a general southerly direction, forming the outlet of Lake Washington, with which it is connected by Washington Bayou, about 7 miles in length, and enters Yazoo River 1.6 miles above Old River, near the head of the Yazoo diversion route. The section included in the project—from Glen Allan, on Lake Washington, to the mouth of Steele Bayou—is about 60 miles.

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[1] Exclusive of amount available for fiscal year 1913.

[2] See consolidated money statement on p. 780.

Before improvement, the lower part of Steele Bayou was navigable for small boats at high stages of the Mississippi River, when the flood water was backed up into the bayou, but navigation was dangerous and obstructed by leaning trees and by snags, stumps, drift, etc.

The project entered upon in the river and harbor act of July 5, 1884, was based upon the report of an examination (without maps) printed in the Report of the Chief of Engineers for 1884, page 1360, and contemplated removal of the obstructions in Steele Bayou to afford greater ease and safety to navigation and to extend its period and limits. The river and harbor act of August 5, 1886, included Washington Bayou in the project, the same kind of work being required in that stream to improve high water navigation. This work was discontinued in 1896, after the expenditure of $12,500.

The existing project, adopted in the river and harbor act approved June 25, 1910, contemplated the removal of snags, logs, stumps, overhanging trees, etc., obstructing navigation of Steele and Washington Bayous and Lake Washington from the mouth of Steele Bayou to Glen Allan, on Lake Washington, in accordance with plan printed in House Document No. 904, Sixtieth Congress, first session. Most of these obstructions were added after work under the original project was suspended. The estimated cost of completing the work in five years was $15,000.

During the fiscal year ending June 30, 1912, operations were carried from a point about 7½ miles below Washington Bayou to the mouth of Steele Bayou, placing it in reasonably safe condition for high-water navigation for the time.

The total amount expended on the existing project to June 30, 1912, was $6,549.81. Work commenced in October, 1910, and in the two seasons since has extended over the waterways covered by the project, has resulted in greater ease and safety to navigation, but, by reason of the limited funds available, has not been thorough, and should be repeated for several years at a cost of about $2,500 per year.

The commerce of 1911—cotton seed, lumber, and saw logs—amounted to 5,187 short tons, valued at $39,332. This was about one-half the amount and one-quarter of the value of the commerce of 1910. The commerce of Washington Bayou is of little value and not increasing.

The rates for transportation by water are much less than by rail. Present navigation is limited to occasional small tows propelled by gasoline boats.

The estimate for the fiscal year 1914 is for maintenance and extending the benefits.

July 1, 1911, balance unexpended	$2,328.05
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,328.05
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	2,500.00
Amount available for fiscal year ending June 30, 1913	2,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

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[1] See consolidated money statement on p. 780.

(*g*) *Bear Creek.*—The stream known as Bear Creek is a succession of small lakes and creeks near the intersection of Leflore, Sunflower, and Washington Counties, Miss. It has its source in Mosquito Lake, about a mile south of Itta Bena, flows south, and enters Yazoo River at Wasp Lake Landing, about 6 miles above Belzoni. A straight line from head to mouth is a distance of only 20 miles, but owing to its irregular course its length is estimated to be about 90 miles. The navigable portion included in the project is about 25 miles long and extends through four lakes at the lower end, the connections between which are dry at low water and require a stage of 15 feet in Yazoo River to enable boats to run. Before improvement, navigation at favorable stages, which exist during an average of three months a year, was difficult, as the connecting watercourses had grown up with trees and brush.

The project, adopted in the river and harbor act approved June 25, 1910, contemplated cutting out the undergrowth which obstructed the 12 miles of watercourse connecting Threemile, Sixmile, Fourmile, and Wasp Lakes, to afford greater ease and safety to navigation at high stages, in accordance with plan printed in House Document No. 908, Sixtieth Congress, first session. The estimated cost of the work was $3,000, to be followed at end of about three years by an appropriation of $2,500 for maintenance.

The work was commenced in November, 1910, and was completed in December, 1911. The cost was greater than estimated, and amounted to $3,346.62. On account of the rapid growth of vegetation, operations should be repeated after a lapse of three years, if maintenance is desirable.

The commerce of 1910, carried by two barges, amounted to 362 short tons of cotton seed and provisions, valued at $23,635. No reports of freight traffic for 1911 were received.

July 1, 1911, balance unexpended	$2,989.50
June 30, 1912, amount expended during fiscal year, for works of improvement	1,795.46
July 1, 1912, balance unexpended	1,194.04
July 1, 1912, outstanding liabilities	325.48
July 1, 1912, balance available	868.56

CONSOLIDATED.

July 1, 1911, balance unexpended		44,097.29
Amount received from sales of property		93.82
Amount received from reimbursement of cost of removing wreck		64.87
		44,255.98
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$1,795.46	
For maintenance of improvement	33,340.07	
		35,135.53
July 1, 1912, balance unexpended		9,120.45
July 1, 1912, outstanding liabilities		2,098.28
July 1, 1912, balance available		7,022.17
Amount appropriated by river and harbor act approved July 25, 1912		100,000.00
Amount available for fiscal year ending June 30, 1913		107,022.17

Amount (estimated) required to be appropriated for completion of existing project	[1] $275,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	[2] 120,000.00
For maintenance of improvement	[3] 40,000.00
Total	[1] [2] 160,000.00

(See Appendix V 7.)

EXAMINATION, WITH PLAN AND ESTIMATE OF COST OF IMPROVEMENT, MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

Reports dated July 29 and September 23, 1909, with maps, on preliminary examination, with plan and estimate of cost of improvement, of *Ouachita River, from Camden to Arkadelphia, Ark.*, together with report dated June 15, 1911, *on survey with a view to the location of a site for a proposed storage reservoir in the interest of navigation on this stretch of river*, required by the river and harbor act approved March 3, 1909, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 588, Sixty-second Congress, second session. The improvement of the Ouachita River, between Camden and Arkadelphia, Ark., by the construction of a reservoir, is not deemed advisable at the present time. A recommendation for a continuance of maintenance operations, at an estimated cost of $2,500 per year for four years, is submitted.

Report dated March 29, 1911, on preliminary examination of *Yalobusha River, Miss., to the town of Derma*, required by the river and harbor act approved June 25, 1910, was duly submitted by the district officer. It was reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and was transmitted to Congress and printed in House Document No. 263, Sixty-second Congress, second session. The improvement of this locality by the United States is not deemed advisable at the present time.

The local officer was also charged with the duty of making other preliminary examinations and surveys required by the river and harbor acts approved March 3, 1909, and June 25, 1910, as follows, and reports thereon will be duly submitted when received:

1. *Red River, La. and Ark.*
2. *Big Black River, Miss.*, from its mouth to the town of West.
3. *Quiver River, Miss.*

IMPROVEMENT OF RIVERS AND HARBORS IN THE LITTLE ROCK, ARK., DISTRICT.

This district was in the charge of Maj. Clarke S. Smith, Corps of Engineers. Division engineer Lieut. Col. Chas. L. Potter, Corps of Engineers.

1. Arkansas River, Ark.—Arkansas River has its source in the Tennessee Pass, in central Colorado, whence it flows in a generally southeasterly direction to the Mississippi River, into which it empties near the southeastern corner of the State of Arkansas. It has a total length of about 1,460 miles, of which 350 are in Colorado, 400 in Kansas, 340 in Oklahoma, and 370 in Arkansas. The general project for the improvement covers the navigable portion extending from the mouth of the river to the mouth of Neosho (Grand) River, 461 miles.

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[1] Exclusive of amount available for fiscal year 1913.
[2] For lock and dam on Big Sunflower River.
[3] For open-channel work.

In its original condition the channel of the river was greatly obstructed by shifting sand bars and numerous snags in its lower reaches, and by gravel and rock shoals and some snags in its upper reaches. Navigation was difficult and uncertain at medium and low stages, and during periods of extreme low water was impossible.

General projects.—Prior to act of Congress approved June 13, 1902, the work on this river was carried on under two general projects—one entitled "Removing obstructions in Arkansas River, Ark. and Kans.," the other "Improving Arkansas River, Ark."

The original project for "Removing obstructions in Arkansas River, Ark. and Kans." (act July 3, 1832), was to remove snags and wrecks. Subsequently this project was enlarged to include removing bars by wing dams, and many of the appropriations were made for this work in combination with other rivers. By act of March 3, 1879, Congress adopted an additional project—that of improving the river between Fort Smith, Ark., and Wichita, Kans., by removing the snags and rocks and constructing dams at some of the worst shoals. Later these projects were merged into one, making the project extend from the mouth of the river to Wichita. Under these projects there was expended to June 30, 1902, $968,256.81.

The original projects for "Improving Arkansas River, Ark.," were local and had in view the permanent improvement of the river at Fort Smith, Van Buren, Dardanelle, and Pine Bluff. By act of August 11, 1888, Congress adopted a general project, namely:

> That the Secretary of War shall expend the appropriation under this head with reference to the final improvement of this river as contemplated in the Report of the Chief of Engineers for the year ending July first, eighteen hundred and eighty-five, and as authorized in the act for the improvement of rivers and harbors approved August fifth, eighteen hundred and eighty-six, and in House Executive Document Numbered Ninety, Forty-ninth Congress, first session; said methods to be applied as the Secretary of War may direct at such points between Wichita, Kansas, and the navigable mouth of the Arkansas River at its junction with the Mississippi River, as he may deem for the best interest of commerce.

The "said methods" referred to in the act were "to remove rock and gravel reefs by blasting and dredging, to contract the channel by dikes and dams, permeable or solid, of such construction as the local conditions require, and to hold the channel so obtained by revetment where necessary." No maps were published in the documents referred to in that act.

The improvement authorized by the act covered 771 miles, while estimates had been rendered for 708 miles, thus making the estimated cost of the improvement under that project indefinite. Act of August 18, 1894, authorized the operation of snag boats under this head in addition to similar operations under the project "Removing obstructions in Arkansas River, Ark. and Kans." To the close of the fiscal year ending June 30, 1902, there had been expended under the general project for improving Arkansas River, Ark., $903,311.93 for original construction, $314,119.14 for maintenance, and $63,397.32 for operating snag boats, making the total amount $1,280,828.39.

Act of Congress approved June 13, 1902, merged those two general projects into one, which makes the existing general project in substance: "The improvement of the river from its mouth to the head of navigation by snagging operations, by dredging operations, and by contraction works, holding the improved channel by revetment where necessary." No definite estimate of cost can be given.

Reference to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Fort Gibson to Little Rock [1]	House	295	Forty-first	Second		
Fort Smith to mouth of Little Arkansas River [1]	do	94	Forty-fifth	Third	1879	1085
At Pine Bluff [1]					1880	1468
Do.[1]	House	151	Forty-eighth	First	1884	1394
At Fort Smith, Van Buren, and Dardanelle [1]	do	151	do	do	1884	1397
Bells Ferry to Rob Roy Bridge [1]	Senate	1		Special	1885	1576
At Van Buren [1]	House	94	Forty-ninth	Second		
Wichita to the mouth [1]	do	234	Fiftieth	First	1888	1886
At Pine Bluff [1]	do	294	Fifty-fourth	Second	1897	1990
At Fort Smith, Van Buren, and Little Rock [1]	do	24	Fifty-fifth	First	1897	1989
At Dardanelle [2]	do	106	do	Second	1898	1676
Mouth to Wichita [2]	do	150	Fifty-sixth	do	1901	2128
At Douglas [1]	do	69	Sixty-first	First		
Mouth to Muskogee [1]	do	71	do	do		
At Pine Bluff [1]	do	71	do	do		
Fort Smith to Tulsa [1]	do	206	do	Second		

[1] No maps.

[2] Contains maps.

Dredging project.—By act of June 25, 1910, Congress adopted a definite dredging project based on reports printed in House Documents No. 71, Sixty-first Congress, first session, and No. 510, Sixty-first Congress, second session. The contemplated work is that of procuring and operating two suction dredges between the mouth of the river and Ozark, 318 miles, at an estimated cost of $349,000 for plant and $118,000 annually for its operation, the object being to aid and encourage navigation.

Originally this work was reported under a separate heading. By act of February 27, 1911, it was consolidated with the other projects under the general heading "Improving Arkansas River."

The act of June 25, 1910, authorized under this appropriation title maintenance of the works at Pine Bluff, Ark. Therefore, by combining the dredging project of June 25, 1910, and the general project of June 13, 1902—a combination effected by act of February 27, 1911—and this authorization, the existing project now is:

> The improvement of the river from its mouth to Ozark (318 miles) by operating two suction dredges; from its mouth to the head of navigation by snagging operations, by dredging operations, and by contraction works, holding the improved channel by revetment where necessary; and maintenance of the works at Pine Bluff, Ark. No estimate for completion can be given.

The operations of this fiscal year were for maintenance of channel by snagging operations, for maintenance of works at Pine Bluff, and making contracts for the construction and delivery of two dredges. The expenditures were $29,368.39 for maintenance of channel, $2,431.70 for maintenance of works at Pine Bluff, and $315.86 toward procurement of two suction dredges. The snagboats *C. B. Reese* and *Arkansas* operated between the mouth of the river and Shoal Creek (281 miles) removing 1,500 snags, cutting 14,459 trees, and breaking up 3 drifts. At Pine Bluff, Ark., repair of flood damages to the revetment were begun. This work is given in detail in the report "Arkansas River at Pine Bluff," page 787 of this report. A contract has been made for the construction and delivery of two suction dredges.

To June 30, 1912, there had been expended on the existing project $323,937.79, of which $253,857.18 was for operating snagboats, $43,866.89 for operations of a hydraulic dredge prior to the 1910 dredging project, $20,470 for maintaining works for permanent improvement built prior to 1902, $5,284.26 for maintaining works at Pine Bluff, and $459.46 toward procurement of two suction dredges. Of these funds $114.57 were derived from sales.

To June 30, 1912, the total expenditures on all projects under this head have been $2,573,022.99, distributed as follows:

Operating snagboats	$1,285,511.31
Hydraulic dredging (prior to 1910)	43,866.89
Construction of works for permanent improvement	903,311.93
Maintenance of those works	334,589.14
Maintenance of works at Pine Bluff, Ark	5,284.26
Procuring suction dredges (1910 project)	459.46
Total	2,573,022.99

Other expenditures on this river are shown on page 650 in the annual report for the fiscal year 1911 under the heading "Arkansas River at Pine Bluff and White River at Augusta Narrows," and on page 787 of this report under the heading "Arkansas River at Pine Bluff."

The permanent improvement of the stream was discontinued before completing that portion of the project. Snagging operations have improved the channel in the permanent reaches; in other localities the improvement has been temporary and must be repeated from time to time.

Fort Gibson, on Neosho (Grand) River, 2 miles above its mouth and 463 miles from the mouth of the Arkansas River, is the present head of steamboat navigation. The duration of the navigable periods of the river varies greatly in different years. Occasionally there are periods of very low water, when navigation will be suspended throughout the length of river, and then there will be times when it is possible to maintain 3-foot navigation through to Fort Gibson all the year. Generally the maximum draft that can be carried at ordinary low water is 3 feet from the mouth of the river to Pendleton (42), 2 feet from Pendleton (42) to Swan Lake (80), 1½ feet from Swan Lake (80) to Webbers Falls (430), and 1 foot from Webbers Falls (430) to mouth of Neosho (Grand) River

(461). The periods of navigation by steamboats are of about the following averages:

	Months a year for 4-foot draft.	Months a year for 2-foot draft.
Mouth to Swan Lake (80 miles)	5½	10
Mouth to Little Rock (174 miles)	5	9½
Mouth to Neosho (Grand) River (461 miles)	4	8

The range between extreme high water and extreme low water at Fort Smith, Ark., is 35.5 feet; at Little Rock, Ark., 30 feet; and at the mouth of the river, where the stages are controlled by those of the Mississippi, the extreme range is 54 feet.

The long period of extremely low water mentioned in last annual report ended July 25, 1911, since which date there have been six and one-half months of good stages for navigation above Pine Bluff (107 miles up the river) and eight months below there.

Commercial statistics.

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1894 (ending May 31)	68,563	$2,846,395	1904 (ending May 31)	92,041	$2,078,893
1895 (ending May 31)	50,498	2,380,420	1905 (ending May 31)	86,458	1,636,930
1896 (ending May 31)	54,261	2,408,720	1906 (ending May 31)	108,214	1,512,719
1897 (ending May 31)	66,077	1,657,218	1907 (ending May 31)	104,593	2,192,531
1898 (ending May 31)	58,578	1,626,756	1908 (ending May 31)	103,919	2,150,269
1899 (ending May 31)	68,057	2,470,181	1909 (ending May 31)	92,456	2,122,105
1900 (ending May 31)	75,654	2,078,940	1910 (ending May 31)	62,172	1,630,338
1901 (ending May 31)	71,998	2,623,797	1910 (calendar year)	59,516	1,612,288
1902 (ending May 31)	40,557	1,630,297	1911 (calendar year)	81,371	1,085,018
1903 (ending May 31)	86,068	2,389,020			

Plantation products and supplies made up 12 per cent and forest products 85 per cent of the commerce for the calendar year 1911, the remaining 3 per cent being unclassified freights. Forty per cent of the total for that year was rafted saw logs.

It does not appear that the improvement of the river in late years has had any marked effect on intrastate freight rates, either by water or by rail. In 1900 and 1901 the improvement of the river reached its highest state of development. Since that time the permanent works have been permitted to deteriorate, and the snag boats working alone have not been able to extend the development any. The intrastate rail rates are controlled by a State railway commission and are based on a "standard distance tariff," and the river is not taken into consideration in making this tariff. This statement applies to all the rivers in the State of Arkansas.

The balance available July 1, 1912, will be expended in snagging operations, in maintenance of works at Pine Bluff, and in procuring dredging plant. The amount estimated for the fiscal year ending June 30, 1914, is for snagging operations and maintenance of works at Pine Bluff. The estimate is based on the assumption that appropriations will be made annually hereafter.

GENERAL PROJECT.

July 1, 1911, balance unexpended	$59,076.00
Received from sales	60.00
Allotted June 20, 1912, from emergency act of Mar. 3, 1909, for works at Pine Bluff	25,000.00
	84,136.00
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	31,800.09
July 1, 1912, balance unexpended	52,335.91
July 1, 1912, outstanding liabilities	12,006.88
July 1, 1912, balance available	[1]40,329.03
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(2)

DREDGING PROJECT.

July 1, 1911, balance unexpended	$404,856.40
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	315.86
July 1, 1912, balance unexpended	404,540.54
July 1, 1912, outstanding liabilities	9.68
July 1, 1912, balance available	404,530.86
July 1, 1912, amount covered by uncompleted contracts	295,514.00

CONSOLIDATED.

July 1, 1911, balance unexpended	$463,932.40
Received from sales	60.00
Allotted June 20, 1912, from emergency act of Mar. 3, 1909, for works at Pine Bluff	25,000.00
	488,992.40
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	32,115.95
July 1, 1912, balance unexpended	456,876.45
July 1, 1912, outstanding liabilities	12,016.56
July 1, 1912, balance available	444,859.89
Amount appropriated by river and harbor act approved July 25, 1912	30,000.00
Amount available for fiscal year ending June 30, 1913	474,859.89
July 1, 1912, amount covered by uncompleted contracts	295,514.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[3]48,000.00

(See Appendix W 1.)

2. Improvement of Arkansas River in Arkansas (in front of Crawford County Levee).—The act of July 25, 1912, made an appropriation of $30,000 for protecting the north bank of the Arkansas River in the bend in front of the Crawford County Levee, south of Van Buren, in sections 8, 9, and 10 in township 8 north, range 30 west; and provided that the work be considered "extraordinary emergency work," and that the appropriation be expended as soon as practicable.

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[1] $7,947.88 for snagging, $32,381.15 for works at Pine Bluff.
[2] See consolidated money statement on this page.
[3] Exclusive of amount available for fiscal year 1913.

The site of this work is in Trusty Bend of Arkansas River, 14 miles below Van Buren, Ark., near the Cross Lanes settlement, where a levee built by a local levee district is in danger of being breached by reason of caving of the bank of the river.

No report of a preliminary examination or survey of this locality has been published.

The Crawford County Levee extends from the south limits of Van Buren, Ark., to near the mouth of Frog Bayou, where it joins the foothills. The length of the levee is 20.2 miles. The area embraced in the leveed territory is a little over 18,000 acres. Drainage of this leveed basin is provided for by means of culverts with automatic flood gates. During the two freshets that passed in April and May of this year (1912) the bank in the bight of Trusty Bend in section 9, township 8 north, range 30 west, receded about 450 feet, the head of the caving being about the west line of section 9 and extending a little east of the east line of section 10. In this distance 7,000 feet of the levee is less than 800 feet, and 4,300 feet of it is between 500 and 330 feet from the river bank. The minimum amount of bank protection needed along this levee front is 2 miles, at an approximate cost of $50,000 a mile.

If it is the intent of Congress to fully protect the levee, $70,000 is the additional amount required to complete the minimum work needed.

There has been no expenditure on this project.

Amount appropriated by river and harbor act approved July 25, 1912	$30,000
Amount available for fiscal year ending June 30, 1913	30,000

(See Appendix W 2.)

3. Arkansas River at Pine Bluff, Ark.—This work is that of completing the restoration of 9,200 linear feet of revetment work that was built along the town front of Pine Bluff in fiscal years 1892–1896 and which was destroyed during freshets in October and November, 1908. The rebuilding of this revetment was begun under the appropriation title "Arkansas River at Pine Bluff and White River at Augusta Narrows, Ark."

The total length of the work from Dike No. 3 to Lone Tree Point is 9,360 feet. All mattress work and the bank paving above 6-foot stage (Pine Bluff gauge) was completed in 1910. During the past fiscal year four freshets—one occurring in April and culminating at 26.2 feet on Pine Bluff gauge, two in May, culminating at 27.7 and 21 feet on that gauge, and one in June, culminating at 19.6 feet—damaged the revetment. Emergency repairs were begun as soon as the first slip was noticed in April and continued through the other three freshets. The damages were due to the unusually strong attack of the current occasioned by the peculiar topography at this point, and it is necessary to rebuild 1,700 feet of revetment, to place channel mattress along 700 feet additional of the old work, and to regrade and repave one-third of the downstream 2,000 feet of the latter. The expenditures under this head during the year were $7,919.66, those to June 30, 1912, being $97,200. Under the appropriation title "Improving Arkansas River at Pine Bluff and White

River at Augusta Narrows," $36,957 was expended on this revetment in previous years and $2,431.70 this year from the appropriation "Improving Arkansas River, Ark.," making the total expenditures on it from November, 1898, to June 30, 1912, $136,588.70.

No further appropriations are recommended under this title, the river and harbor acts of June 25, 1910, and February 27, 1911, having made provision for the maintenance of this work under the heading "Improving Arkansas River, Ark." For map of this locality see Annual Report of the Chief of Engineers for 1911, page 1883.

July 1, 1911, balance unexpended	$7,919.66
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	7,919.66

(See Appendix W 3.)

4. *Improvement of White River, Ark.*—The White River has its source in the Boston Mountains, in the extreme northern portion of Franklin County, Ark., whence it flows in a northerly direction into the State of Missouri, thence to the east and to the southeast, returning to Arkansas in Boone and Marion Counties, 230 miles from its source. From the north line of Marion County, Ark., it flows in a southeasterly direction 200 miles, to Newport, Ark., thence in a southerly direction 260 miles, to a junction with the Arkansas River, 8 miles upstream from a point where the latter debouches into the Mississippi. The total length of the river is 690 miles. Its navigable portion extends from its mouth to Forsyth, Mo., 505 miles. The length of river covered by this project is 301 miles, extending from the Mississippi River to Batesville, Ark.

In its original condition this river was much choked by logs, snags, and drift in its lower reaches, and in its upper reaches—i. e., above Jacksonport—by gravel shoals, bowlders, and some snags.

The original project (act of Mar. 3, 1871) was to remove snags and similar obstructions, the work being combined with similar work on Black and Little Red Rivers. Act of June 23, 1874, extended the improvement to Forsyth, Mo., the project being to remove snags and bowlders, and to contract the water width at shoals. During the period 1873–1884 the snagging operations on the lower river were in conection with similar work on St. Francis River, while the improvement above Jacksonport was under appropriations confined to that portion of the stream. The act of July 5, 1884, was the first independent appropriation for the river as a whole. It readopted and consolidated into one the separate projects, and provided for a survey with a view to the permanent improvement of the river from Forsyth, Mo., to the mouth. The project of 1888 (Annual Report of the Chief of Engineers for 1888, p. 1406) was to deepen the water on shoals by contracting the channel, and to remove rocks, bowlders, and snags from the channel, the object being to obtain a channel 5 feet deep at low water from the mouth to Newport and 2 feet deep thence to Buffalo Shoals, at an estimated cost of $105,815, with an additional amount of $8,000 a year for two or three years for snagging. For reasons given in the Annual Report of the Chief of Engineers for 1891, page 2049, the estimates were inadequate to accomplish the object. The act of July 13, 1892, appropriated $53,815 to complete the project, and an additional sum of $21,185 to be expended "in the discretion of the Secretary of War." These funds and those appropriated since have been expended on the lines of the project of 1888, with the addition of dredging on the shoals. The act of March 3, 1899, adopted a lock-and-dam project for the improvement of this river above Batesville, thus reducing the scope of the former project to improving the river from the mouth to Batesville by contracting the channel, by removing rocks, bowlders, and snags, and by dredging.

It is not practicable to state the expenditures on this river when the work was caried on in connection with other rivers. On the projects prior to March 3, 1899, there were expended from the separate appropriations for the whole river or its reaches, $362.801.57.

The report on the survey upon which the project is based is printed in the Annual Report of the Chief of Engineers for 1888, on pages 1406-1412. No general map of the locality is published in that report, but some sketches of a few localities are shown.

References to examination or survey reports and maps or plans not in project document.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Forsyth to the mouth [1]					1871	864
James Fork to Buffalo Shoals [1]					1872	874
At Devalls Bluff Bridge [1]	Senate	104	Forty-eighth	First	1884	1409
Jacksonport to Forsyth [1]	House	98	Fifty-fourth	do	1896	1607
Batesville to Buffalo Shoals [1]	do	78	do	Second	1897	1992
Do.[1]	do	150	Fifty-ninth	First		
At Augusta Narrows [1]	do	71	Sixty-first	do		

[1] No maps.

The existing project is for improving the river from the mouth to Batesville by contracting the channel; by removing rocks, bowlders, and snags, and by dredging.

The operations this fiscal year were for maintenance of channel by snagging operations. By the operations of the snagboats *Quapaw*, *Arkansas*, and *C. B. Reese* 1,172 snags were removed, 4,263 trees cut, and 47 drifts broken between the mouth of the river and Black Island.

To June 30, 1912, there has been expended $134,756.11 in maintenance of channel below Batesville, Ark., $71.68 of which was derived from sales, etc. The total expenditures on the river for open-channel work from the first separate appropriation to June 30, 1912, are $497,557.68.

The contraction works built above Jacksonport under the earlier projects gave some increase in channel depth and the dredging between Jacksonport and Batesville in the fiscal year 1898 made a channel 3 feet deep during one low-water season, but the dredging has not been continued, no plant being available. The snagging operations make the natural depths of the stream available during the low-water season in which the work is done. The winter and spring floods following bring other obstructions into the stream, hence snagging operations are needed every year.

Forsyth, Mo. (505 miles above the mouth), is the head of steamboat navigation. From its mouth to Jacksonport, 264 miles, the river is generally spoken of as being navigable at any time for boats of not over 3-foot draft. Between Jacksonport and Batesville, where Lock No. 1 of the upper White River improvement is located, the low-water channel depths are approximately 16 inches.

The range between extreme high water and extreme low water below Dam No. 1 at Batesville is 35.5 feet; at Jacksonport, 34.4 feet; at Clarendon, 32.5 feet; and at the mouth of the river, 54 feet.

Commercial statistics.

Years.	Short tons.	Value.	Years.	Short tons.	Value.
1895 (ending May 31)	73,759	$2,494,377	1904 (ending May 31)	193,498	$1,021,778
1896 (ending May 31)	74,882	2,056,991	1905 (ending May 31)	134,588	770,689
1897 (ending May 31)	73,962	2,435,814	1906 (ending May 31)	100,083	766,138
1898 (ending May 31)	102,337	1,415,013	1907 (ending May 31)	127,812	830,659
1899 (ending May 31)	117,891	1,619,351	1908 (ending May 31)	161,246	962,508
1900 (ending May 31)	134,696	2,244,222	1909 (ending May 31)	134,200	671,230
1901 (ending May 31)	148,574	1,700,355	1910 (ending May 31)	141,771	619,718
1902 (ending May 31)	184,066	1,242,438	1910 (calendar year)	118,496	863,022
1903 (ending May 31)	140,013	882,225	1911 (calendar year)	143,285	1,448,401

Forest products made up 90 per cent of the commerce reported for the calendar year 1911, agricultural products and farm supplies formed only 7 per cent, and the remaining 3 per cent was made up of mussel shells and unclassified freights.

The balance available July 1, 1912, will be expended in maintenance of channel by snagging operations. The amount estimated as being needed for the fiscal year ending June 30, 1914, is for snagging operations over the entire river below Batesville and for dredging operations between Batesville and the mouth of Black River. It is based on the assumption that appropriations will be made annually hereafter.

July 1, 1911, balance unexpended	$25,979.62
Receipts from sales	30.25
	26,009.87
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	17,080.87
July 1, 1912, balance unexpended	8,929.00
July 1, 1912, outstanding liabilities	1,616.54
July 1, 1912, balance available	7,312.46
Amount appropriated by river and harbor act approved July 25, 1912	18,000.00
Amount available for fiscal year ending June 30, 1913	25,312.46
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 20,000.00

(See Appendix W 4.)

5. *Upper White River, Ark.*—The designation Upper White River, Ark., as used in these reports is to cover that portion of White River lying between Batesville, Ark., and Buffalo Shoals. The earlier

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[1] Exclusive of the amount available for fiscal year 1913.

works on this portion of White River were made under appropriations for improving White River, Ark., and have been fully reported under that head.

The original condition of the river and previous projects for its improvement are also reported there.

The existing project, adopted March 3, 1899, is based on a report printed in the Annual Report of the Chief of Engineers for 1897, page 1992, and is to provide slack-water navigation from Batesville, Ark., to Buffalo Shoals, 89 miles, by 10 fixed dams with concrete locks. The locks are to be 175 feet between hollow quoins and 36 feet wide, with a depth of about 4 feet on the lower miter sills. The estimated cost is there given as $1,600,000 for the 10 locks and dams.

To June 30, 1912, there have been expended on this work $813,774.51, of which $583.53 were derived from sales.

Three locks and dams have been built and are operated under the indefinite appropriation for "Operating and care of canals and other works of navigation."

A board of engineers appointed pursuant to requirement of the river and harbor act of March 3, 1905, to consider this project reported the construction of further locks and dams not desirable. This report is printed in House Document No. 150, Fifty-ninth Congress, first session.

Forsyth, Mo., 204 miles above Batesville, is the head of steamboat navigation. The channel depths over the shoals in the unimproved part of the river are small, being only 8 to 10 inches during lowest waters. The range between high and low water at Buffalo City, the head of this project, is about 45 feet. Below Dam No. 1, at Batesville, this range is 35.5 feet.

The only operations this year were those of procuring and placing 407 cubic yards of stone in the bank protection below the abutment at Dam No. 3, all available funds being thus expended. The funds held in the Treasury are to cover unclaimed wages and other outstanding liabilities. No further work being contemplated, further reports are unnecessary.

For commercial statistics see report on "Operating and care of locks and dams, Upper White River, Ark."

July 1, 1911, balance unexpended	$442.53
Received from sales	375.00
	817.53
June 30, 1912, amount expended during fiscal year, for works of improvement	508.51
July 1, 1912, balance unexpended	309.02
July 1, 1912, outstanding liabilities	309.02

(See Appendix W 5.)

6. *Operating and care of locks and dams Nos. 1, 2 and 3, Upper White River, Ark.*—The locks and dams were built with funds derived from appropriations for improving Upper White River, Ark. The dimensions of the chamber of each lock is: Available length, 147 feet; available width, 35 feet; depth over miter sills at

normal pool level, 5 feet. Dam No. 1 is 660.5 feet long; Dam No. 2 is 658 feet, and Dam No. 3 is 750.7 feet long.

Lock and Dam No. 1 was placed under this appropriation on January 16, 1904; Lock and Dam No. 2, on February 16, 1905; and Lock and Dam No. 3, on February 1, 1908.

The high-water mark of May, 1898 (before the dams were built) is 22 feet above the crest of Dam No. 1, 18.4 feet above the crest of Dam No. 2, and 25.2 feet above the crest of Dam No. 3. The highest stages reached by the river since the dams have been completed were 20 feet above the crest of Dam No. 1 and 18.2 feet above the crest of Dam No. 2, on May 8, 1907. Since the completion of Dam No. 3 there has been no extreme high water.

The lowest stages this fiscal year were "minus" 0.2 foot on the crest of Dam No. 1; 0.1 foot on the crest of Dam No. 2, and 0.7 foot on the crest of Dam No. 3, July 18, 1911.

The expenditures during the year were for ordinary operation expenses of the locks and repairs to structures and plant, the largest single items being for new gates at Lock No. 2 and for new hull to dredge *No. 68*. The total amount expended on the maintenance of these works to June 30, 1912, is $212,284.32, of which $35,842.64 was expended during the past fiscal year.

Commercial statistics.

Years.	Lock No. 1.		Lock No. 2.		Lock No. 3.		Freights that did not pass through a lock.
	Lockages.	Freights.	Lockages.	Freights.	Lockages.	Freights.	
	Number.	*Short tons.*	*Number.*	*Short tons.*	*Number.*	*Short tons.*	*Short tons.*
1904 (ending May 31)	[1] 115	8,320					7,335
1905 (ending May 31)	244	8,771	[2] 60	4,168			5,060
1906 (ending May 31)	246	7,806	183	8,692			2,496
1907 (ending May 31)	191	6,798	263	9,431			1,288
1908 (ending May 31)	249	13,746	661	22,077	[3] 126	4,337	7,583
1909 (ending May 31)	190	4,427	549	14,143	810	7,162	5,143
1910 (ending May 31)	187	893	808	17,934	527	9,167	2,306
1910 (calendar year)	152	1,069	846	17,395	515	8,739	6,983
1911 (calendar year)	160	784	464	11,391	379	5,463	7,283

[1] Four months. [2] Three and one-half months. [3] Five months.

Cooperage and wheel stuffs and railway ties made up the bulk of the commerce.

(See Appendix W 6.)

7. *Cache River, Ark.*—Cache River, Ark., has its source in the flatlands of Clay County, Ark., whence it flows about 300 miles in a south-southwesterly course to the White River at Clarendon, Ark. Operations under the present project extend from the mouth of the river to Gregory Bridge, 86 miles.

In its original condition this river was much obstructed by snags, drift, and overhanging timber. The low-water depth on the controlling shoals was 6 to 8 inches.

The original project, adopted by the act of August 11, 1888, was to remove logs, snags, and overhanging timber from the mouth to Riverside (102 miles). The amount expended on this project was $9,000.

The river and harbor acts of August 18, 1894, and June 3, 1896, each authorized the Secretary of War to expend $2,000 of the White River appropriations on this stream. The river and harbor act of March 3, 1899, revived this as an independent work thus: "Improving Cache River, Arkansas: To be expended in removing obstructions, one thousand dollars." No definite statement as to length of river to be improved was stated. The funds obtained from those three acts and subsequent ones have been expended in maintenance of channel by snagging operations, first below James Ferry, 79 miles above the mouth, and later extended to Gregory Bridge, 86 miles above the mouth.

The original project was based on a report printed on page 1547, Annual Report of the Chief of Engineers for 1887. No maps are given in the report.

Reference to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to Wilson Landing [1]	House	60/2	Forty-first	Third	1871	854
Martin Bridge to mouth [1]	do	38	Forty-sixth	do	1881	1477
Riverside to mouth [1]					1896	2067
Upper river above lower line Jackson County.[1]	House	176	Fifty-ninth	Second		

[1] No maps.

The existing project is one for maintenance of channel by snagging operations, no definite limits for the work and no estimate for completion being given.

The operations during the past fiscal year were for maintenance of channel below Gregory Bridge, 86 miles, by snagging operations. A chopping party, with a small scow fitted with a winch for raising logs, worked over this part of the river, removing 2,231 snags, cutting 705 trees, breaking 33 drifts, and girdling 480 trees. These operations left the channel through "the lakes" between James Ferry and Gregory Bridge in better condition than ever before. Below James Ferry they maintained the good condition existing at the close of the fiscal year ending June 30, 1911.

To June 30, 1912, there had been expended $19,555.97 on maintenance of channel. The total expenditures to that date under all projects were $28,555.97, of which $100.30 were derived from sales.

The operations have been of material benefit to commerce in lengthening the navigable periods by rendering the natural depths of the stream available for navigation purposes.

Grays Bridge, 95 miles above the mouth of the river, is considered the head of steamboat navigation, but the river is not navigable to that point all the year, the ruling depth in the channels over the shoals throughout the river being only 8 to 10 inches during lowest water. During high-water seasons rafts are run from 100 or more miles above Grays Bridge. In the vicinity of James Ferry (79 miles above the mouth of the river) the range between high and low water is about 15 feet. Because of backwater from White River this range is increased to 24 feet at Rock Island Railway Bridge and to 32 feet at the mouth of the river.

Commercial statistics.

Years.	Short tons.	Value.	Years.	Short tons.	Value.
1895 (ending May 31)	12,603	$25,494	1904 (ending May 31)	15,865	$49,601
1896 (ending May 31)	20,748	62,483	1905 (ending May 31)	11,680	29,868
1897 (ending May 31)	34,990	106,460	1906 (ending May 31)	19,942	31,777
1898 (ending May 31)	10,193	36,635	1907 (ending May 31)	13,050	39,225
1899 (ending May 31)	7,667	52,936	1908 (ending May 31)	21,178	50,254
1900 (ending May 31)	11,215	29,961	1909 (ending May 31)	9,420	36,150
1901 (ending May 31)	10,374	30,100	1910 (ending May 31)	23,426	72,070
1902 (ending May 31)	15,676	40,301	1910 (calendar year)	23,134	98,763
1903 (ending May 31)	16,843	109,681	1911 (calendar year)	40,308	82,316

The commerce reported during the year was made up entirely of saw logs and rough lumber. Ninety-four per cent of the total was rafted logs.

The balance available July 1, 1912, and the additional appropriation recommended will be expended in snagging operations for maintenance of channel. The additional appropriation recommended is based on the assumption that appropriations will be made annually hereafter.

July 1, 1911, balance unexpended	$3,632.44
Received from sales	55.00
	3,687.44
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	3,143.11
July 1, 1912, balance unexpended	544.33
July 1, 1912, outstanding liabilities	.52
July 1, 1912, balance available	543.81
Amount appropriated by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	3,543.81
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 2,000.00

(See Appendix W 7.)

8. *Black and Current Rivers, Ark. and Mo.*—Prior to the fiscal year 1905 the work on these rivers was provided for under separate appropriation titles. The works were consolidated by river and harbor act of March 3, 1905.

(*a*) *Black River.*—Black River has its source in the Ozark Mountains in the northwest corner of Reynolds County, Mo., whence it flows first in a southeasterly direction to the south line of the State of Missouri, then in a southwesterly direction to White River at Jacksonport, Ark. Its total length is about 360 miles, of which the lower 235 miles from its mouth to Poplar Bluff, Mo., is covered by project for improvement.

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[1] Exclusive of amount available for fiscal year 1913.

In its original condition this river below the mouth of Current River had, at ordinary low water, a controlling depth of 2 to 2½ feet on the shoals, but this was not available on account of snags and similar obstructions. Above the mouth of Current River navigation was practically impossible at ordinary low stages, and no rafting was possible above the Arkansas and Missouri State line.

The original project, adopted by act of June 14, 1880, contemplated removing logs, etc., cutting down shoals by means of wing dams, and closing some of the most troublesome sloughs. The estimated cost was $80,800. The only modification of the project has been that of changing the estimate for maintenance. While dredging is not specifically mentioned in the project, it is necessary as a means of maintenance and has been so authorized.

The report of the examination, upon which the project is based, is given in Annual Report of the Chief of Engineers for 1880, page 1326. Reports of prior examinations are given in the Annual Reports of the Chief of Engineers for 1871, page 374, and for 1872, page 379. No maps are included with those reports.

The operations during the year were for maintenance of channel by snagging operations. The snag boat *Quapaw* worked over the river below the mouth of Current River and the snag boat *Riverside* between Current River and Poplar Bluff, Mo. By these two boats 2,408 snags were removed from the channel, 1,862 trees cut out, and 18 drifts broken.

To June 30, 1912, there had been expended on this work $195,327.39, of which $28.86 were derived from receipts from sales, etc.

Poplar Bluff, Mo., 239 miles above the mouth of the river, is the head of navigation. All-the-year navigation has been made possible to this place for boats of not over 18 inches draft. Boats of not over 2½ feet draft can navigate this river below the mouth of Current River, 116 miles, during the lowest waters, and this portion of the river is generally spoken of as being navigable for 3-foot boats at any time.

The range between high and low water at Poplar Bluff is 19 feet. This difference decreases below Poplar Bluff, and in the flat lands to the southward it averages about half of this, being 8.5 feet at Corning Bridge, 70 miles below Poplar Bluff. After passing to below head of Little River the difference between high and low water increases, and at Pocahontas, 129 miles below Poplar Bluff, the difference is 26.5 feet, and at the mouth of the river it is 34.4 feet.

(*b*) *Current River.*—Current River has its source in the Ozark Mountains in Texas County, Mo. It first flows in a northeasterly direction, then in a southeasterly direction to the south line of Missouri, then in a southwesterly direction to Black River in Randolph County, Ark. Its total length is about 200 miles, of which the lower 94 miles, from its mouth to Van Buren, Mo., are under project for improvement.

The original condition of this stream was such that no steamboat navigation above the mouth of Little Black River was attempted except when the river was at high stages. Below Little Black River navigation was suspended when the river was below medium stage. The natural depths were not available on account of snags and leaning trees.

Although the United States made some improvements to this stream in 1873, and again in 1882 and 1883, the regular improvement of it was not undertaken until act of Congress of August 18, 1894, adopted a project for its improvement from Van Buren, Mo., to the mouth by snagging operations and by contracting the channel at the worst shoals by wing dams, at an estimated cost of $10,000. The appropriation of June 3, 1896, completed the amount originally estimated for the completion of the project, and all operations since then have been under estimates for maintenance. No wing dams have been built, all operations having been confined to snagging.

Report of preliminary examination of the river from Van Buren, Mo., to the mouth, that being the portion covered by the approved project, is given in the Annual Report of the Chief of Engineers for 1891, page 2065, and with map in House Document No. 157, Fifty-first Congress, second session.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Van Buren to mouth [1]					1872	396
Do.[1]	House	38	Forty-sixth	Third	1881	1467
Do.[1]	do	227	Fifty-second	Second	1893	2128
Crooked Creek to lower line of Carter County [1]	do	65	Fifty-sixth	First	1900	2614

[1] No maps.

The existing project is the improvement of the river from Van Buren, Mo., to the mouth by snagging operations and by contracting the channel at the worst shoals by wing dams.

The expenditures during the fiscal year were for maintenance of channel by snagging operations carried on by the snag boat *Quapaw* from the mouth to the mouth of Little Black, 32 miles; by the snag boat *Riverside* from the mouth to Pats Bay, 46 miles; and by a chopping party between there and Bark Camp Creek, 34 miles. By these operations 971 snags and 3 bowlders were removed from the channel, 585 trees cut, and 12 drifts broken.

To June 30, 1912, there has been expended on this project $48,650.29, of which $38,650.29 was for maintenance. Of this $15 was derived from sales, etc. The total expenditures under all projects to June 30, 1912, was $55,650.29.

Van Buren, Mo., 94.5 miles above the mouth of the river, was taken as the head of navigation when the earlier projects for this river were adopted. Small gasoline boats occasionally ply the river that far up, and rafts are run over the entire river, but Pitmans Landing, near the State line between Arkansas and Missouri and 41 miles above the mouth of the river, is generally spoken of as the head of steamboat navigation. Boats can not reach that point, however, during low-water seasons, the low-water depths of the river being as follows: Three feet from the mouth to Blunts (Johnsons Landing), 25 miles; 2 feet from Blunts to mouth of Little Black River, 7 miles; and 16 inches from mouth of Little Black River to Pitmans Landing, 9 miles. From Pitmans Landing to Doniphan, 12 miles, the head of the work done by snag boats now, the low-water depths are about 12 inches.

The range between high and low water at Van Buren is about 16 feet, and this range does not vary much until below the mouth of Little Black River, when the range increases to 19 feet.

Commercial statistics.

Years.	Black River.		Current River.	
	Value.	Short tons.	Value.	Short tons.
1895 (year ending May 31)	$1,085,415	132,483	$362,447	31,205
1896 (year ending May 31)	891,437	111,278	227,291	29,867
1897 (year ending May 31)	1,704,799	111,611	581,528	17,078
1898 (year ending May 31)	788,640	115,612	306,216	52,417
1899 (year ending May 31)	529,336	83,404	239,869	43,050
1900 (year ending May 31)	966,961	129,698	578,834	65,043
1901 (year ending May 31)	989,635	185,714	234,555	64,102
1902 (year ending May 31)	919,767	166,218	165,766	87,185
1903 (year ending May 31)	695,649	138,181	142,899	45,309
1904 (year ending May 31)	1,092,648	191,285	139,119	55,573
1905 (year ending May 31)	1,004,299	144,065	409,297	74,048
1906 (year ending May 31)	625,985	139,884	152,216	47,704
1907 (year ending May 31)	692,968	107,914	226,655	48,496
1908 (year ending May 31)	517,906	140,826	115,898	27,696
1909 (year ending May 31)	439,355	86,070	36,802	10,786
1910 (year ending May 31)	471,219	75,677	124,001	25,082
1910 (calendar year)	348,042	74,082	121,801	22,557
1911 (calendar year)	298,271	95,635	67,611	24,014

Logging and kindred industries furnished the bulk of the commerce, and of that reported for the year 59 per cent on Black River and 38 per cent on Current River was rafted saw logs.

The balance available July 1, 1912, will be expended in snagging operations for maintenance of channel and maintenance of plant. The amount estimated for the fiscal year ending June 30, 1914, is for maintenance of channel in Current River by snagging operations and in Black River by snagging and dredging operations. The estimate is based on the assumption that appropriations will be made annually hereafter.

BLACK RIVER.

July 1, 1911, balance unexpended	$9,594.42
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	8,562.45
July 1, 1912, balance unexpended	1,031.97
July 1, 1912, outstanding liabilities	107.33
July 1, 1912, balance available	924.64
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	12,000.00
Amount available for fiscal year ending June 30, 1913	12,924.64
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	([1])

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[1] See consolidated money statement on p. 798.

CURRENT RIVER.

July 1, 1911, balance unexpended	$5,191.98
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	3,992.27
July 1, 1912, balance unexpended	1,199.71
July 1, 1912, outstanding liabilities	10.93
July 1, 1912, balance available	1,188.78
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	4,188.78
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

CONSOLIDATED.

July 1, 1911, balance unexpended	$14,786.40
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	12,554.72
July 1, 1912, balance unexpended	2,231.68
July 1, 1912, outstanding liabilities	118.26
July 1, 1912, balance available	2,113.42
Amount appropriated by river and harbor act approved July 25, 1912	15,000.00
Amount available for fiscal year ending June 30, 1913	17,113.42
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2]25,000.00

(See Appendix W 8.)

9. St. Francis and L'Anguille Rivers and Blackfish Bayou, Ark.—(*a*) *St. Francis River.*—St. Francis River has its source in the Ozark Mountains in St. François County, Mo., whence it flows in a southerly direction 490 miles to the Mississippi River, 8 miles above Helena, Ark. From its source to Wappapello, Mo., 120 miles, the river is a mountainous stream. At Wappapello it leaves the St. Francis Mountains, spurs of the Ozarks, and enters the alluvial basin of the Mississippi River. The portion of the river included in this project extends from its mouth to Kennett, Mo., 260 miles, the upper 80 miles of which are through the Sunken Lands of the St. Francis.

In its original condition this stream was not navigable above Lesters Landing at any stage; between Lesters Landing and Marked Tree navigation was possible at high stages only, and below Marked Tree it was difficult at medium and low stages and impossible at extreme low water.

The original project adopted by act of March 3, 1871, contemplated improvement from the mouth to Wittsburg by snagging operations. For the period 1873–1882 the appropriations were made for this work in connection with White River, Ark. By act of June 14, 1880, appropriation was made for improving the river from Wittsburg to Lester Landing, the project for the expenditure of this appropriation being to cut a channel through " The Lake " and clear the river of obstructions by snagging operations. Appropriation made by act

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[1] See consolidated money statement on this page.
[2] Exclusive of amount available for fiscal year 1913.

of July 5, 1884, was the first separate appropriation for the entire river. The act did not state the limits within which it was to be applied. Under it snagging operations were carried on to the town of St. Francis, Ark., and several of the sloughs or side channels were closed. When the improvement of St. Francis River, Mo., was begun (act of Aug. 11, 1888), Kennett, Mo., was taken for the upper limit of this work, making the existing project—

> removal of logs, drifts, and snags from the channel, and overhanging timber from the banks from the mouth to Kennett, Mo., and closing the chutes and sloughs in the Sunk Lands, so as to make the river navigable at high stages to Kennett, Mo., at medium stages to Marked Tree, and at low stages to a point 30 miles below Madison, Ark., the estimated cost being $8,000 annually.

(b) *L'Anguille River.*—L'Anguille River has its source in the flat lands of Poinsett and Craighead Counties, Ark., whence it flows in a southerly direction to St. Francis River, emptying into that stream 12 miles above its mouth. The portion of the river included in this project extends from St. Francis River up to the town of Marianna, Ark., 8 miles. The navigable stages, like those of the lower St. Francis River, are controlled by the stages of Mississippi River, the back water from which gives navigable stages to Marianna when the Helena gauge reads 12 feet or more. During periods of low water the channel width over the shoals is only 10 to 20 feet. At bank-full stages the river width varies from 300 to 550 feet.

By acts of June 18, 1878, March 3, 1879, and June 14, 1880, a total of $17,000 was appropriated for snagging operations on L'Anguille River to Marianna. This was finally expended in fiscal year ending June 30, 1887. Act of June 13, 1902, revived this work and included it with St. Francis River. Therefore the existing project is to improve the river from its mouth to Marianna, 8 miles, by snagging operations, no estimate for completion or annual estimate for maintenance being stated.

(c) *Blackfish Bayou, Ark.*—Blackfish Bayou is one of the principal drainage channels for the lower portion of the St. Francis Basin. Its headwaters are in the west central portion of Crittenden County, from where it flows in a southwesterly direction through the eastern portion of St. Francis County to near the south line of that county, where it empties into St. Francis River, 44 miles above the mouth of that stream. From the St. Francis River up to the mouth of Fifteenmile Bayou—about 6 miles—Blackfish Bayou has a low-water width of 125 to 150 feet, a width of 250 to 300 feet when at bank-full stage, a low-water depth over the controlling shoals slightly greater than that over the shoals in St. Francis River, neither stream being navigable by boats of commerce during low-water periods. The navigable stages of Blackfish Bayou up to the mouth of Fifteenmile Bayou, like those of the lower St. Francis River, are controlled by the stages of the Mississippi River, and backwater from the Mississippi River gives a navigable stage in Blackfish Bayou up to Fifteenmile Bayou when the Helena gauge reads 17 feet and above.

The existing project, adopted by the river and harbor act of June 25, 1910, in accordance with report printed in House Document No. 73, Sixty-first Congress, first session, provides for the removal of snags and overhanging timber obstructing the channel in connection with similar work now being done on the St. Francis River, at an estimated cost of $500 annually, and the said act provides that of the consolidated appropriation made, not exceeding that sum may be expended, in the discretion of the Secretary of War, for the purpose stated.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Maumelle Prairie to mouth [1]	House	60	Forty-first	Third	1871	358
Greenville to Maumelle Prairie [1]					1873	476
Greenville to Lester Landing [1]	House	60	Forty-sixth	Third	1881	1481
Greenville to State Line [1]					1887	1549
Greenville to Sunk Lands [1]					1895	2049
Sunk Lands to Poplin [1]	House	82	Fifty-fourth	Second	1897	1999
Mouth to Wittsburg and Marianna [2]	do	125	Fifty-fifth	do	1898	1678
Greenville to mouth of Mingo [1]	do	41	Fifty-sixth	First	1900	2618
Kennett to mouth [1]	do	163	Fifty-ninth	do		

[1] Without maps.

[2] With maps.

The existing project is to remove snags and similar obstruction in St. Francis River from its mouth to Kennett, Mo.; in L'Anguille River from its mouth to Marianna, and in Blackfish Bayou from its mouth to Fifteenmile Bayou; also to close chutes and sloughs in the Sunken Lands on the St. Francis.

The operations during the fiscal year were for maintenance of channel by snagging operations and consisted in operating the snag boat *A. B. Johnson* on St. Francis River between the mouth and Marked Tree, 169 miles, removing 656 snags, cutting 166 trees, and breaking 5 drifts; on L'Anguille River below Mariana, 8 miles, removing 62 snags, cutting 37 trees, and breaking 1 drift; and on Blackfish Bayou below Fifteenmile Bayou, 6 miles, removing 102 snags and cutting 82 trees. At the close of the year the *A. B. Johnson* was resuming operations at Marked Tree, Ark.

To June 30, 1912, there had been expended $141,829.89 on these streams, of which $4.19 was derived from receipts from sales. This, however, does not include the expenditures on St. Francis River while it was combined with White River, as those expenditures can not be determined from the information now available.

By the early operations the St. Francis River between Wittsburg and Lesters Landing was improved to such an extent that boats could reach the latter-named place on the same stage as they could the former. By subsequent operations the period of navigation below Wittsburg was lengthened about two months, and above Lesters Landing a fair high-water channel was made. The improvements thus made below Wittsburg have been maintained. No effort is being made to maintain those above Marked Tree, the commerce on that portion of the river not warranting any expenditures at this time.

During periods of low water neither stream is navigable, there not being sufficient depth of water over the shoals. Marianna is the head of navigation on L'Anguille River. The head of navigation on St.

Francis River is near Wappapello, Mo., about 100 miles above Kennett, Mo., the upper limit of the portion of the river covered by this project. Lying between Kennett, Mo., and Foot of Lake, 80 miles below, are the Sunken Lands of the St. Francis, one vast swamp, through which the river flows in several channels, none of which is well defined and all of which are more or less obstructed and frequently blocked. Lesters Landing is 34 miles above Foot of Lake and is the practicable head of navigation on the St. Francis River in Arkansas. Boats can pass between it and Kennett, Mo., only during high stages, and then only with great difficulty.

Under ordinary conditions when the levees along the Mississippi River front of the St. Francis Basin are intact the range between high and low water of the St. Francis River at Lesters Landing is about 3 feet. This increases to 19.8 feet at Marked Tree, which is the maximum that would exist at any point below there were it not for the backwater from the Mississippi River, but on account of that backwater the range at Madison is 36 feet. At the mouth of the river the oscillation is 56 feet. When crevasses in the levees along the St. Francis front occurred in the spring of 1912, the oscillation at Marked Tree was 24.2 feet and at Madison 42 feet.

Commercial statistics.

Years.	Short tons.	Value.	Years.	Short tons.	Value.
1894 (ending May 31)	19,768	$98,375	1904 (ending May 31)	119,172	$423,469
1895 (ending May 31)	88,107	821,489	1905 (ending May 31)	142,098	590,560
1896 (ending May 31)	67,740	401,457	1906 (ending May 31)	137,819	472,257
1897 (ending May 31)	97,848	1,117,891	1907 (ending May 31)	151,015	833,397
1898 (ending May 31)	23,819	237,481	1908 (ending May 31)	286,820	1,876,757
1899 (ending May 31)	27,892	815,459	1909 (ending May 31)	160,057	1,148,855
1900 (ending May 31)	45,035	194,237	1910 (ending May 31)	180,270	679,662
1901 (ending May 31)	57,102	272,609	1910 (calendar year)	247,945	1,648,585
1902 (ending May 31)	85,831	260,190	1911 (calendar year)	298,470	1,443,778
1903 (ending May 31)	88,035	294,495			

Forest products—45 per cent of which were rafted saw logs—made up 91 per cent of the total commerce reported for the year. The remaining 9 per cent was made up of plantation products and supplies, mussel shells, and general freights. There is no separation of the commerce carried over the three rivers. That arising or terminating on Blackfish Bayou passes over portions of St. Francis River, as does most of that terminating on L'Anguille River.

The balance available July 1, 1912, will be expended in snagging operations in St. Francis River. The amount estimated as being needed for the fiscal year ending June 30, 1914, is for maintenance of channels in the three rivers by snagging operations—$500 in Blackfish Bayou—the remainder in St. Francis and L'Anguille Rivers. The estimate is based on the assumption that appropriations will be made annually hereafter.

July 1, 1911, balance unexpended	$9,112.18
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	6,700.35
July 1, 1912, balance unexpended	2,411.83
July 1, 1912, outstanding liabilities	1,021.99

July 1, 1912, balance available	$1,389.84
Amount appropriated by river and harbor act approved July 25, 1912	9,000.00
Amount available for fiscal year ending June 30, 1913	10,389.84
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 7,000.00

(See Appendix W 9.)

EXAMINATIONS AND SURVEYS REQUIRED BY RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

The local officer was also charged with the duty of making other preliminary examinations and surveys provided for by the river and harbor act of June 25, 1910, as follows, and reports thereon will be duly submitted when received:

1. *St. Francis River, Ark.*, from its mouth to the mouth of L'Anguille River, and *L'Anguille River from its mouth to the city of Marianna.*
2. *White River, Ark.*, at and near Devall Bluff, with a view to improvement for navigation and the revetment of the banks in cooperation with local interests.

IMPROVEMENT OF RIVERS AND HARBORS IN THE ST. LOUIS, MO. DISTRICT.

This district was in charge of Lieut. Col. Charles L. Potter, Corps of Engineers. Division engineer, Lieut. Col. Charles L. Potter, Corps of Engineers.

1. *Removing snags and wrecks from the Mississippi River below the mouth of the Missouri River and from the Atchafalaya and Old Rivers.*—When this work was originally begun the navigation of the river was seriously obstructed by numerous snags, logs, etc., which had lodged in the channel, and to which additions were made with each rise of the river. A large number of wrecked flatboats, barges, steamboats, and other river craft also obstructed the navigable channels and menaced life and property.

For the removal of these obstructions appropriations were made as early as 1824. The project adopted consisted of building boats suitable for removing snags, logs, drift heaps, wrecks, etc., and operating them whenever the stage of the river was favorable and funds were available, and in cutting trees from caving banks to prevent their falling into the river and becoming obstructions to navigation.

The existing project is a continuation of the plan adopted in 1879, when the first specific appropriation for removing snags, wrecks, etc., from the Mississippi River was made by the river and harbor act approved March 3 of that year. Specific appropriations or allotments were made for this work each year thereafter, except 1883, 1885, and 1887, but by section 7 of the river and harbor act of August 11, 1888, a continuous annual expenditure of $100,000, or as much thereof as might be necessary, was authorized for the maintenance of this service, and this amount has been available each year since to the present time. The river and harbor act of March 3, 1909, makes available so much of this appropriation as the Secretary of

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[1] Exclusive of amount available for fiscal year 1913.

War may deem necessary for the removal of snags and other floating and sunken obstructions in the Atchafalaya and Old Rivers from their junction with the Mississippi and Red Rivers down the Atchafalaya River as far as Melville, La.

No modification of the project has been made since its adoption, the plan being continuous, and new obstructions being brought down by each freshet in the river. So much of the continuous appropriation as may be required each year hereafter will be applied to their removal.

The amount expended upon this work prior to June 30, 1872, can not now be ascertained, for the reason that during that time and to March 3, 1879, appropriations were made in lump sums, principally under the title "Improvement of Mississippi, Missouri, and Arkansas Rivers," to be applied to the several streams as their needs or the terms of the law required. The available records do not show the amount applied to each stream.

The approximate amount expended from July 1, 1872, to June 30, 1880, was $493,437.23, and the definitely known amount expended from July 1, 1880, to June 30, 1912, was $2,501,896.41, making the total of approximate and known expenditures to date $2,995,333.64.

From March 28, 1868 (the earliest available record of work done), to June 30, 1912, 104,949 snags, 139 wrecks, and 670 drift piles were destroyed, and 449,073 trees were cut, greatly improving the river and lessening the dangers of navigation.

During the fiscal year two steel-hull snagboats were engaged in removing such obstructions between the mouth of the Missouri River and New Orleans, La., and Old River and the Atchafalaya to Melville, La., a total distance of about 1,200 miles; 1,517 snags, 11 drift piles, and 14 wrecks were destroyed, 1,698 trees were cut, and 10,147 miles patrolled.

During 1908–1910 part of the funds appropriated for the removal of obstructions was expended for the removal of Beaver Dam Rock, an obstructive and dangerous rock lying in midchannel about 1 mile below Commerce, Mo., and about one-half of the necessary work was accomplished. During the fiscal year 1911 the work was completed, except for the removal of débris from the shattered rock, under the appropriation for general improvement of the river between the mouths of the Ohio and Missouri Rivers.

For information as to the commerce benefited by work under this appropriation reference should be made to the commercial statistics in the report of the district officer upon improving the Mississippi River between the Ohio and Missouri Rivers and in the reports of the Mississippi River Commission and the district officers thereunder.

The amount expended during the year was $97,978.58.

(See Appendix X 1.)

2. *Mississippi River between Ohio and Missouri Rivers.*—In its original condition, prior to any improvement, the navigable channel of this section of the Mississippi River had a natural depth in many places of only 3½ to 4 feet at low water. The main channels were divided by islands and bars, which formed chutes, sloughs, and secondary channels, through which a considerable part of the volume of the flow was diverted, to the detriment of navigation.

The first systematic effort to improve this condition was begun by the Federal Government in 1872, and was continued for a number of years as appropriations were made, the works of improvement consisting of dikes and dams of brush and stone to confine the low-water volume to a single channel and of revetments to hold and preserve the banks where necessary or advisable.

The project followed in later years to the present time has been practically that adopted in 1881, approved by letter of the Chief of Engineers dated March 31, 1881, which sought to obtain eventually within the district, at standard low water, a minimum navigable channel depth of 6 feet above St. Louis and 8 feet below that city by confining the flow of the river to a single channel having an approximate width of 2,500 feet at bank-full stage, the natural width in many cases being a mile or more at mean high water, this result to be secured by closing sloughs and secondary channels and by building out new banks where the natural width is excessive, using for the purpose permeable dikes or hurdles of piling to collect and hold the solid matter carried in suspension or rolled on the bottom by the river, the banks, both new and old, to be revetted or otherwise protected where necessary to secure permanency. Modifications of the project in the river and harbor acts of 1896 and 1902 provided that, pending the completion of the permanent improvement, the required low-water channel depth should be maintained each season by the use of dredges and other temporary expedients.

The river and harbor act of March 3, 1905, radically changed the project by limiting work of improvement to dredging only, adopting one of the recommendations of the board of engineers, November 12, 1903, to the exclusion of the others. The recommendation of the board fixed the channel depth to be obtained at 8 feet for the river reach below St. Louis, with a minimum width of 200 feet.

This change in plan was modified by joint resolution of Congress, June 29, 1906, authorizing, after all dredging expenses were provided for, the application of the balance of funds remaining to the credit of the appropriation of 1905 to the repair or completion of improvements under the former projects or to the construction of other works useful to navigation.

The river and harbor act of March 2, 1907, confirmed the change of plan to dredging and temporary expedients as principal means of channel improvement and limited expenditure for works of permanent character, first, to the maintenance and repair of works already constructed, and thereafter, with any funds remaining, to the construction of other works of channel regulation; but the small amounts appropriated yearly under this act almost precluded extension of the existing system of permanent works.

The river and harbor act approved June 25, 1910, restored the plan adopted in 1881, together with dredging, as the plan to be followed in prosecuting the improvement, with a view to its completion within a period of 12 years.

The report of the special board on examination and survey of the Mississippi River from the Lakes to the Gulf, March 20, 1909, which virtually recommended the early completion of the 1881 project as indorsed and modified by the 1903 board, put the cost of such completion at $21,000,000, in addition to all amounts already expended. Of this sum $2,750,000 has been appropriated in the river and harbor and sundry civil acts of 1910, 1911, and 1912, leaving the balance yet to be appropriated $18,250,000.

The object of the previous and present plans of improvement is, therefore, to obtain and maintain a minimum depth at standard low water of 6 feet from the mouth of the Missouri to St. Louis and of 8 feet from St. Louis to the mouth of the Ohio.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Between Missouri and Ohio Rivers[1]	House	168	Fifty-eighth	Second	1904	2144 et seq.
St. Louis to mouth of Mississippi River[2]	do	50	Sixty-first	First		

[1] No maps. [2] Contains maps.

The total amount appropriated to June 30, 1912, is $14,894,999.98, of which $180,000 was alloted by acts and projects for improvement between the mouths of the Illinois and Missouri Rivers, including Alton Harbor, $10,000 was allotted for Wittenberg, Mo., and $1,400,000 was for methods of improvement under the acts of 1905, 1907, 1908 and 1909.

The total amount expended to June 30, 1912, for improvement between the Ohio and Missouri Rivers, project of 1881, is $13,364,269.50. The $10,000 for Wittenberg, Mo., was carried to the surplus fund.

The balance unexpended June 30, 1912, is $22,680.52.

The result of the expenditure of this amount has been the partial permanent improvement of the entire extent of the river from St. Louis to Cairo, and during recent years practically the maintenance of the channel depths required.

The improvement has probably had a beneficial influence on freight rates, as the rates to localities reached by water are well known to be lower than those remote from this advantage, but an accurate estimation of such effect is impracticable.

The new appropriation asked for is the estimated expenditure for one year only, and should be followed by such amounts annually as will permit the completion of the improvement within the period specified.

It is proposed to expend the new appropriation asked for in such permanent and temporary improvements as may be necessary and are authorized.

The amount expended by vouchers and by the auditor during the fiscal year ending June 30, 1912, was $978,055.12, which includes $18,322.63, expended for other appropriations for which reimbursements are pending, leaving $959,732.49 expended on the improvement; for dredges and dredging, care and increase of plant, and for maintenance and repair of existing works of revetment and contraction, and for the extension of such works of both kinds, in pursuance of the project referred to.

During the past year the river stages have been favorable, and there was maintained a channel depth of 8 feet below St. Louis during the entire season when the river was unobstructed by ice, except for very short periods at two places where the depths were reduced to 6 feet until dredges could be brought into action, when the required depth was quickly obtained.

At Grand Tower, Ill., natural silting up and closing of the chute east of Grand Tower Island had forced the boat channel to the west of that island over a bar of gravel and bowlders which could not be moved by the suction dredges in use. A channel 200 feet wide, down to a depth of 3 feet below the zero of the Grand Tower gauge, had been made across this bar under contract during the fiscal years 1910–11, but during the abnormally low-water season of 1910, this channel proved to be of insufficient width and depth on account of outcropping bowlders, and it was decided to widen the channel to 300 feet and deepen it to 5 feet below the zero of the gauge. The enlarged channel was about one-half completed during the fall season, using a dipper dredge borrowed from the Rock Island engineer district.

During the fiscal year the river at St. Louis reached a high-water stage of 26.8 feet above standard low water (4 feet, St. Louis gauge) April 6, 1912, and a low-water stage of 2.0 feet below standard low water on January 8, 1912.

With the present appliances and works of permanent improvement, it is expected that a navigable depth of about 8 feet will be maintained between St. Louis and Cairo during all stages of river open to navigation.

July 1, 1911, balance unexpended		$995, 562. 12
Miscellaneous receipts		5, 173. 52
		1, 000, 735. 64
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$674, 858. 04	
For maintenance of improvement	303, 197. 08	
		978, 055. 12
July 1, 1912, balance unexpended		22, 680. 52
July 1, 1912, outstanding liabilities		9, 064. 19
July 1, 1912, balance available		13, 616. 33
Amount appropriated by river and harbor act approved July 25, 1912		1, 000, 000. 00
Amount available for fiscal year ending June 30, 1913		1, 013, 616. 33
Amount (estimated) required to be appropriated for completion of existing project		[1] 18, 250, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 1, 000, 000. 00

(See Appendix X 2.)

EXAMINATION AND SURVEY REQUIRED BY RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

The local officer was also charged with the duty of making a preliminary examination and survey, respectively, of *Mississippi River*,

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[1] Exclusive of amount available for fiscal year 1913.

Ill., opposite the city of St. Louis, from the south end of Cabaret Island to the north end of Arsenal Island, for the purpose of providing a suitable channel by revetment of the bank, and reports thereon will be duly submitted when received.

IMPROVEMENT OF RIVERS AND HARBORS IN THE ROCK ISLAND, ILL., DISTRICT.

This district was in the charge of Maj. Charles Keller, Corps of Engineers. Division engineer, Lieut. Col. Charles L. Potter, Corps of Engineers.

1. Operating snag boats and dredge boats on upper Mississippi River and tributaries.—By the river and harbor act of August 11, 1888, provision was made for securing the uninterrupted work of snag boats and dredge boats on the upper Mississippi River under a permanent appropriation, the sum so expended not to exceed $25,000 annually.

By river and harbor act of March 2, 1907, the annual appropriation for operating snag boats on the upper Mississippi River was made available for similar purposes on the Illinois River from its mouth to Copperas Creek.

By river and harbor act of March 3, 1909, the annual appropriation for operating snag boats was also made available for similar purposes on the Minnesota River and other tributaries of the upper Mississippi River now or heretofore improved by the United States. This act extends the snag-boat jurisdiction on the Illinois River from Copperas Creek to La Salle, and on the Minnesota, the St. Croix, Chippewa, Wisconsin, Black, Galena, and Rock Rivers.

During the past fiscal year the snag boat *David Tipton* was employed from July 1 to November 9, 1911, and from April 27 to June 30, 1912, in removing snags and other obstructions and otherwise assisting the interests of navigation in the Mississippi River between the mouth of the Missouri River and St. Paul and in the St. Croix River below Stillwater.

The total amount expended for snag-boat service to June 30, 1912, is $1,123,975.

The total quantity of freight transported on the upper Mississippi River within the limits of this district during the calendar year 1911 was about 2,081,566 short tons, and the ton-miles 149,151,826. In 1910 these quantities were 1,830,000 short tons and 106,039,260 ton-miles. The increase in freight tonnage in 1911 is entirely due to the increase in the Government work in towing material, other items of freight traffic remaining about the same as in 1910.

The amount expended during the fiscal year ending June 30, 1912, was $25,000.

(See Appendix Y 1.)

2. Mississippi River between Missouri River and Minneapolis, Minn.—Between Missouri River and St. Paul, Minn.—Under this head is carried on the improvement of through navigation and also such special harbor or levee work as is provided for by Congress. Systematic work was begun in 1878, and such good results have been secured as to demonstrate that with a continuance of operations under liberal appropriations the low-water channel of the Mississippi River between St. Paul and the Missouri River can be made sufficiently deep, available, and permanent to satisfy the demands of commerce.

The general direction of flow is south; the distance from St. Paul to the Missouri River, the limits of the project, is by low-water channel about 658 miles, and the distance from the mouth of the Missouri to the Gulf of Mexico about 1,275 miles.

The original condition of the channel between the Missouri River and St. Paul was such that in low stages the larger boats were unable to proceed farther upstream than La Crosse or Winona, and in many seasons at points much lower down their progress was checked or seriously hindered.

The original project for the improvement, adopted in 1879, proposed the contraction of the channel or waterway by means of wing and closing dams to such an extent as, by means of the scour caused, to afford a channel of sufficient width and of a depth of 4½ feet at low water. There was expended under the original project and the provisional project of 1897 to June 30, 1911, $12,108,965.40, of which about $750,000 was applied to maintenance. At that date and for many years previous the condition of the channel was such as to permit the passage of the largest river boats at very low stages to St. Paul. It should be noted that of the amount above stated $1,062,000 has been expended for harbors and levees not connected with through channel improvement.

The existing project, for the purpose of ultimately securing and maintaining a depth of 6 feet, was adopted by Congress March 2, 1907, and is given in full with detailed estimate in House Document No. 341, Fifty-ninth Congress, second session. It provides for further contraction of the channel, for rock excavation, for auxiliary dredging, for further improvement of the Rock Island Rapids by lateral canal and rock excavation, for repairs to existing work, and maintenance during construction. The estimate of cost is $20,000,000, and for care and maintenance after completion $300,000 per annum.

The river and harbor act of June 25, 1910, provided that this improvement should be prosecuted with a view to its completion within a period of 12 years.

No change has been made in this project since its adoption.

During the past year work in construction of dams and shore protection has been carried on by hired labor and use of Government plant between Alma and Fountain City, at Zumbro River, vicinity of Winona, Trempealeau, Richmond, and Dakota, at La Crosse, vicinity of Dubuque, Nine Mile Island, and Bellevue, at or near Clarksville, Taylor Island, Cincinnati Landing and Mundys Landing, and above Grafton.

By hired labor dredging was done at a very large number of localities, and rock excavation was carried on in Moline pool and at Rockingham and Horse Island. Under formal contract, construction work was performed in vicinity of Wabasha, McGregor, Cassville, Spechts Ferry, Dubuque, Linwood, Buffalo, Montpelier, Pine Creek, Flint Creek Levee, Turkey Island, Becks Landing, and Churchs Landing. The total expenditure for above work was $1,121,418.39.

To June 30, 1912, the amount expended since the 6-foot project was adopted was $3,404,186.10, of which $3,174.47 was for maintenance.

At all localities where work was performed, good results were obtained.

With the expenditure during the past year an increased depth was obtained at several localities.

Needed repairs were made to dams and shore protections broken, settled, or otherwise damaged.

The maximum draft that could be carried June 30, 1912, from the Missouri River to St. Paul, 658 miles, at mean low water (stage 1.5 above extreme low water) was, as nearly as could be ascertained, 4.5 feet.

About 16 per cent of the approved project has been accomplished June 30, 1912.

The navigation interests are important, although much less than in former years, owing to the decrease in the handling of logs and the manufacture of lumber. The amount of freight carried during the season of 1911 was about 2,081,566 short tons, having an approximate value of $38,928,961, the tonnage being 12 per cent and the valuation 90 per cent greater than in 1910.

The amount required for expenditure in fiscal year ending June 30, 1914, is to be used in the continuation of improvement work in accordance with the 6-foot project adopted by Congress March 2, 1907, for the purpose of extension of benefits of navigation. It is the estimated expenditure for one year only.

Freight rates charged by rail and river from St. Louis to several points on upper Mississippi River on classes 1–5, western classification.

[In cents per 100 pounds.]

To—	By rail.	By river.	1.		2.		3.		4.		5.	
			Rail.	River.	Rail.	River.	Rail.	River.	Rail.	River.	Rail.	River.
	Miles.	*Miles.*										
St. Louis	0	0										
Quincy	140	155	35	28	28	22.5	22	17.5	15.5	12.5	12.5	10
Keokuk	178	192	37	30	31	25	23	18	16.5	13	13	10
Fort Madison	202	213	39	30	32	25	24	18	17	13	14	10
Burlington	222	234	39.6	30	32	25	24.8	18	18	13.5	15.9	11
Rock Island	249	313	40.7	33	32.9	26	25.6	20	20.5	15	16.4	12
Clinton	287	349	42.8	33	34.7	26	27.1	20	21.7	15	17.8	12
Dubuque	347	411	45.9	33	37.6	26	29.7	20	23	15	18	12
La Crosse	461	532	50	34	42	28	33	22	23	16	18	12
Winona	488	560	50	34	42	28	33	22	23	16	18	12
St. Paul	576	676	60	40	50	34	40	27	25	17	20	14

It will be noted that the water rates are about 66 per cent of the rail rates. While it is not claimed that river improvements are solely responsible for the great difference in freight rates as shown, it is well known that wherever water competition exists, whether by river, canal, or lake, its effect on freight rates is always beneficial to the public, and that so long as the navigation of the Mississippi River is feasible, and largely in proportion to its feasibility, such benefits will accrue, even if but little river commerce is actually carried on.

It is well known that the railroads strive keenly for the north-and-south freight business, make much lower rates where there is water competition, cut their rates on certain commodities, and, it is reported, make sometimes especially low rates for the season of navigation, to be increased during the winter months. This latter practice was common several years ago.

A thorough classification of the freight carried by steamboats in 1911 was found impracticable, and a reliable statement of amount saved can not be given, the question being further complicated by the fact that a great part of the freight was package freight carried at arbitrary rates. It is to be remembered that benefit also accrues to the public in the reduction, due to the river, of rates on freight carried by rail, the amount of which freight, although not definitely known, is thought to be very much greater than that carried by boats.

The continued prosecution of the improvement to a greater extent than in recent years seems advisable, in order that the condition of the river for through navigation may be maintained and more rapidly improved. It is not anticipated that any further material reduction in freight rates on the adjacent railways will thus be had, but there would otherwise be danger that any lessened efficiency of the river for navigation would soon result in an increase in freight rates, and the volume of freight that might thus be affected is so great that a very small increase on these rail rates would annually exceed in total amount the recent annual appropriations for the portion of the Mississippi River in question.

Commercial statistics will be found under head of operating snag boats, etc. (*1*).

Winter work was continued with satisfactory results, being confined to localities not readily reached with boats and barges during the open season.

For dredging in harbors and at landing places and maintenance of United States levees, the river and harbor acts of June 25, 1910, and February 27, 1911, each provided $75,000. From the provision in the former act allotments have been made for dredging at Alton Slough, at Quincy Bay and harbor, at Burlington, Rock Island, Moline, Lake City, and Stockholm, and for protecting the river banks adjacent to portions of the Flint Creek—Iowa River Levee. The amount expended during the past fiscal year is $23,130.40, and to June 30, 1912, including expenditures 1907–1910, $125,205.92.

The river and harbor act of July 25, 1912, makes an appropriation of $1,250,000 for continuing the improvement and for maintenance in accordance with report printed as House Document No. 341, Fifty-ninth Congress, second session, for the purpose of securing and ultimately maintaining a depth of 6 feet, and with a view to completing the improvement within a period of 12 years from June 30, 1910, and also provided that of the amount appropriated, $25,000 may be expended for the repair and maintenance of existing levees constructed by the United States.

July 1, 1911, balance unexpended		$1,484,563.89
Miscellaneous receipts		238.65
		1,484,802.54
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$1,135,893.87	
For maintenance of improvement	2,128.91	
		1,138,022.78
July 1, 1912, balance unexpended		346,779.76
July 1, 1912, outstanding liabilities		189,711.08
July 1, 1912, balance available		157,068.68

Amount appropriated by river and harbor act approved July 25, 1912	$1,250,000.00
Amount available for fiscal year ending June 30, 1913	1,407,068.68
July 1, 1912, amount covered by uncompleted contracts	121,378.04
Amount (estimated) required to be appropriated for completion of existing project	[1] 15,000,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 1,500,000.00

(See Appendix Y 2.)

3. Operating and care of Des Moines Rapids Canal and dry dock.—During the past year the Des Moines Rapids Canal was open for navigation 237 days, during which time there passed through it 2,287 steamboats and 1,044 barges, carrying 33,160 passengers, 42,018 short tons of merchandise, and 620 bushels of grain. There also passed through the canal 5,372,718 feet of lumber and 8,188,011 feet of logs. The tonnage was about four times as great as that of the previous year.

The depth afforded by the canal is 5 feet at extreme low water, which may be increased to 6 feet at high stages. There are 3 locks, each having an available length of 325 feet and width of 78.5. The minimum width of the canal prism at water surface is 200 feet.

The dry dock was in constant use during the entire year.

The cost of operating and care of the canal is provided for by an indefinite appropriation made by river and harbor act of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act approved March 3, 1909.

The total expenditures to June 30, 1912, amounted to $1,458,103.88, of which $35,218.51 was expended during the past year.

Great progress has been made by the Keokuk & Hamilton Water Power Co. in the construction of dam, power house, lock, and dry dock, and it is expected that their work will be completed by July, 1913, at which time this canal, its 3 locks, and dry dock will be abandoned and the new single lock and dry dock will come into use.

(See Appendix Y 3.)

4. Operating and care of Mississippi River improvement at Moline, Ill.—The lock, which admits boats to Moline and also forms with its approaches a link in the 6-foot channel improvement of Rock Island Rapids, was formally opened to navigation December 23, 1907. During the past fiscal year the lock was in use 234 days, during which time there passed through it 1,277 boats and 399 barges, carrying 12,299 short tons of freight and 7,749 passengers. The tonnage of the lock was about 360 per cent greater than that of the previous year.

The depth afforded by the lock and lower approach is 6 feet at extreme low water, and on completion of this portion of the rapids improvement there will be 6 feet in the upper approach.

The lock has an available length of 325 feet and width of 80 feet.

The cost of operating and care of the lock and improvement at Moline is provided for by an indefinite appropriation made by river and harbor act of July 4, 1884, as amended and reenacted by section 6 of the river and harbor act approved March 3, 1909.

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[1] Exclusive of amount available for fiscal year 1913.

The expenditures to June 30, 1912, amounted to $43,137.92, of which $13,206.16 was expended during the past year.

(See Appendix Y 4.)

5. Operating and care of Galena River improvement, Illinois.—This improvement, consisting of a lock and dam in the Galena River, was purchased by the United States in March, 1894, under provisions of the act of September 19, 1890, at a cost of $100,000.

During the past fiscal year the lock was open for navigation 225 days, in which time there passed through it 3,141 steamboats, barges, and launches of an aggregate gross tonnage of 8,807 short tons, carrying 10,445 passengers and 2,404 short tons of merchandise, which traffic was about the same as that of 1911.

A small amount of dredging was done in Harris Slough and above the lock.

The draft that can be carried at extreme low water is 2 feet, as limited by the depth on the lower miter sill of the lock, which has an available length of 280 feet and width of 52 feet.

The cost of operating and care of the improvement is provided for by section 6 of the river and harbor act of March 3, 1909.

The amount expended to June 30, 1912, is $107,234.70, of which $7,258.68 was expended during the year.

(See Appendix Y 5.)

6. Illinois and Mississippi Canal, Ill.—The object of the improvement is to furnish a link in a navigable waterway from Lake Michigan to the Mississippi River. The canal proceeds form the Illinois River, 1¾ miles above Hennepin, Ill., via the Bureau Creek Valley and over the summit to Rock River at the mouth of Green River; thence by slack water in Rock River and a canal around its lower rapids to the Mississippi River at the mouth of Rock River. A navigable feeder nearly 29 miles in length from Rock Falls to the summit level supplies the main canal with water. The canal is at least 80 feet wide at the water surface and 7 feet deep, with 33 locks 150 feet long and 35 feet wide in the chamber. It was opened to navigation October 24, 1907. Further particulars in regard to the Illinois and Mississippi Canal are printed in report of the Chief of Engineers for 1910, pages 799 and 800.

Nothing was done under head of construction except the purchase of steel beams and lumber for ice chutes at Aqueducts 1, 4, and 5.

Considerable progress was made in the construction of the lock in Rock River at the head of the feeder provided for in the river and harbor act of June 25, 1910.

There has been expended on this work to June 30, 1912, $7,557,135.20.

With available funds it is proposed to complete the lock in Rock River at head of feeder, to raise and reenforce the banks in vicinity of Locks 3 and 4, to complete the ice chutes at the aqueducts above named, and to perform other miscellaneous work.

Unexpended balance June 30, 1912, $55,660.24, of which $39,855.25 is for construction and $15,804.99 for Rock River Lock.

July 1, 1911, balance unexpended	$80,245.97
Receipts	13,551.00
	93,796.97
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	38,136.73
July 1, 1912, balance unexpended	55,660.24
July 1, 1912, outstanding liabilities	94.24
July 1, 1912, balance available	55,566.00

(See Appendix Y 6.)

7. *Operating and care of Illinois and Mississippi Canal.*—The main canal, consisting of the eastern and western sections and the feeder, and the Milan section around the lower rapids of Rock River, have hitherto been operated independently under separate projects and estimates. The main canal was opened to navigation October 24, 1907, but the Milan section has been in operation since April 17, 1895.

The entire canal, which affords 7-foot navigation from the mouth of Rock River at Rock Island, Ill., to Hennepin, on the Illinois River, is fed from Rock River by a navigable feeder from Rock Falls to the summit level, except the Milan section, which receives its water from Rock River direct. There are 33 locks of varying lifts, having an available length between miter sills of 150 feet and a width of 35 feet. The canal prism has a minimum width of 80 feet on the water surface.

The canal was open to navigation from July 1 to November 24, 1911, and from April 1 to June 30, 1912, a period of 238 days.

In the main canal work consisted in patrolling banks, ditching, operating locks, maintaining and repairing structures; building, maintaining, and operating boats and barges, revetting banks, and repairing breaks. Its commerce, combining the business of the guard lock and Locks 1 and 29, including both commercial and Government business, was, for varying distances, 2,219 boats, launches, and barges, carrying 37,631 short tons of freight and 4,502 passengers; ton-miles, 1,317,085. The tonnage was about 50 per cent greater than the previous year.

In the Milan section ordinary repairs were made to buildings, locks, banks, bridges, and floating plant, and a contract for widening and deepening South Slough was let, under an allotment of $20,000 for the purpose. The traffic of the Milan section, as shown by that of Lock 37 and which was about equal to that of the previous year, comprised 1,346 boats, 307 barges, 5,051 short tons of freight, and 3,852 passengers. The ton-miles were 20,204.

The operating expenditures to June 30, 1912, were for the main canal $767,997.81; for the Milan section, $194,353.75; total, $962,351.56; for the fiscal year, main canal, $170,299.40; Milan section, $17,811.97; total, $188,111.37.

The cost of operating and care of the canal is provided for by section 6 of the river and harbor act of March 3, 1909.

(See Appendix Y 7.)

8. *Improving Illinois and Mississippi Canal.*—The river and harbor act of February 27, 1911, appropriated $125,000 for improving

Illinois and Mississippi Canal by raising Aqueduct 1, Lock 4, one highway bridge and approaches and the banks of the canal where the canal crosses East Bureau Creek, just below the Chicago, Rock Island & Pacific Railway bridge across the same stream.

A tentative project for performing this work was prepared, but the officer in charge stated that he thought it preferable, before expending any considerable part of the appropriation, to install ice chutes in two more spans of the aqueduct, to dredge away the deposit at and above the aqueduct, and to watch the results of these changes. He also desired to obtain further information in regard to the shoaling in Bureau Creek before going ahead with the work covered by the project.

A thorough survey demonstrated that the work indicated was not necessary or desirable, and that the flood troubles were in no way due to the construction of the canal. An alternative project proposes the protection of certain portions of the canal bank, the lowering of the bed of the creek in vicinity of Aqueduct 1, and the possible dredging of the creek from Bridge 3 to the Illinois River. As the cost of this work can probably be defrayed from available funds pertaining to construction and operating and care of the canal, it may not be necessary to expend any further amount of this appropriation, and it may perhaps be advisable, after a year or two, to cover the balance into the Treasury.

Amount appropriated by river and harbor act approved Feb. 27, 1911	$125,000.00
Expended during fiscal year ending June 30, 1912	104.64
July 1, 1912, balance unexpended	124,895.36

(See Appendix Y 8.)

EXAMINATION AND SURVEY REQUIRED BY RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

The local officer was also charged with the duty of making a preliminary examination and survey of *Rock River, Ill. and Wis.*, provided for by the river and harbor act of March 3, 1909, and reports thereon will be duly submitted when received.

EXAMINATION AND SURVEY REQUIRED BY THE RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

The local officer was also charged with the duty of making a preliminary examination and survey, provided for by the river and harbor act approved February 27, 1911, of *Mississippi River between Calhoun Point and Mason Island, Ill.*, and reports thereon will be duly submitted when received.

IMPROVEMENT OF RIVERS AND HARBORS IN THE ST. PAUL, MINN., DISTRICT.

This district was in the charge of Lieut. Col. Francis R. Shunk, Corps of Engineers, except between February 1 and March 12, 1912, when it was in the temporary charge of First Lieut. John N. Hodges, Corps of Engineers. Division engineer, Lieut. Col. Chas. L. Potter, Corps of Engineers.

1. Mississippi River between St. Paul and Minneapolis, Minn.—The Mississippi River has its source in Lake Itasca, in the northern part of the State of Minnesota, and flows in a southerly direction to the Gulf of Mexico, its length being about 2,440 miles. It is navigable for steamboats in one stretch from its mouth to St. Paul, a distance of about 1,940 miles.

The section included in this improvement extends from the Chicago, St. Paul, Minneapolis & Omaha Railway Bridge in St. Paul to Washington Avenue Bridge in Minneapolis, 11.4 miles. Before improvement, boats drawing 3 feet could go up at ordinary low water as far as the mouth of the Minnesota River, 2.66 miles above the Chicago, St. Paul, Minneapolis & Omaha Railway Bridge. From the Minnesota River to the present site of Dam No. 2, a distance of 6.56 miles, there was a channel about 2½ feet deep; but on account of the velocity of the current, upstream freighting was difficult and unprofitable. From this point to the Washington Avenue Bridge, a distance of 2.18 miles, the depth was not more than 2 feet at ordinary low stage, and the velocity such as effectually to prevent navigation. Before 1894 work was done in this part of the river under allotments from the appropriations for "Improving the Mississippi River from the landing on the west bank below the Washington Avenue Bridge, Minneapolis, to the Des Moines Rapids." A total amount of $59,098.70 was thus expended in dredging, bank protection, and construction of wing dams. As a result considerable improvement was made in the navigable reaches, but the limits of navigation were not extended.

In 1894 a separate project was adopted for the Mississippi River between St. Paul and Minneapolis. It provided for two locks and dams—one (No. 1) just above the mouth of Minnehaha Creek, and 3.68 miles above the Minnesota River, to have a lift of 13.3 feet; another (No. 2), 2.88 miles above No. 1 and 2.18 miles below Washington Avenue Bridge, Minneapolis, to have a lift of 13.8 feet. The lock chambers were to be 80 feet by 334 feet, and the depth on the lower miter sills 5 feet at low water.

This project was modified by the act of March 2, 1907, which required a channel depth of 6 feet instead of 5 feet. This involved an increase in the lift of the two dams and an increase in the depth on the lower miter sill of Lock No. 1 to 6 feet at low water.

The river and harbor act approved March 3, 1899, authorized the completion of Lock and Dam No. 2 and the construction of Lock and Dam No. 1, under continuing contracts or otherwise, at a total cost, for both locks and dams, of $1,166,457. An increase in the limit of cost to $1,466,000 was authorized by the river and harbor act approved March 3, 1905. This act authorized continuing contracts for the completion of the work in the sum of $299,543, all of which has been appropriated.

The amount expended under this project to June 30, 1912, was $1,162,592.97, of which $2,792.43 was for maintenance.

The project was further modified by the river and harbor act approved June 25, 1910, in accordance with recommendation contained in House Document No. 741, Sixty-first Congress, second session. As it now stands Lock and Dam No. 1, instead of being completed with the lift originally intended (13.3 feet), are to be given a lift of about 30 feet. This will give a depth of 9½ feet at Washington Avenue

Bridge in Minneapolis and provide for the development of power and implies the abandonment of Lock and Dam No. 2.

The modification of the project involves an increase in the estimated cost over that of the project of 1905 of approximately $635,000. This amount includes, however, $180,000 for flowage rights, some of which may be acquired without cost to the United States.

Before the project was last modified (June 25, 1910) Lock and Dam No. 2 had been completed and in operation since May, 1907. The masonry of Lock No. 1 had been completed as then authorized, but no work had yet been done on Dam No. 1.

Until the completion of Lock and Dam No. 1 the work can not have much beneficial effect on the navigability of the river.

During the year the lock walls were built up to the required height on the land side and on about three-quarters of the river side. The lower miter sill was removed and rebuilt about 5½ feet lower. The portion of the dam included in the lock cofferdam inclosure (about 48 feet in length) was built. Excavation was completed and work commenced on the power-house foundation. The project is about 46 per cent completed.

The expenditure on the modified project to June 30, 1912, was $367,707.20. The maximum draft that could be carried on June 30, 1912, from St. Paul to Minneapolis was 2 feet, the river below Dam No. 2 being 1.3 feet below the mean low stage during navigation season (3 feet on the St. Paul gauge).

The usual variation of level of water surface is about 8 feet, with a maximum variation of about 16 feet.

The head of navigation for large boats now is the mouth of the Minnesota River, 2.7 miles above the Chicago, St. Paul, Minneapolis & Omaha Railway bridge in St. Paul. The reach from the mouth of the Minnesota River to Minnehaha Creek, a distance of 3.3 miles, is regularly used by light-draft excursion boats.

At the present time the principal commerce is the passage of logs, loose and rafted. During the calendar year 1911, 9,000,000 feet b. m. of logs, approximately 40,000 short tons, with an estimated value of $200,000, were floated down the river. The excursion business amounts to about $10.000 per annum.

The construction of the lock and dam may develop a passenger traffic between St. Paul and Minneapolis, and is expected to reduce the freight rate on flour and grain shipped from Minneapolis.

It is proposed to expend the amount required for expenditure during the fiscal year 1914 in completing the construction of the dam.

July 1, 1911, balance unexpended	$423,611.71
June 30, 1912, amount expended during fiscal year, for works of improvement	237,311.88
July 1, 1912, balance unexpended	186,299.83
July 1, 1912, outstanding liabilities	32,879.28
July 1, 1912, balance available	153,420.55
Amount appropriated by river and harbor act approved July 25, 1912	200,000.00
Amount available for fiscal year ending June 30, 1913	353,420.55
July 1, 1912, amount covered by uncompleted contracts	7,306.18

Amount (estimated) required to be appropriated for completion of existing project	[1] $185,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 185,000.00

(See Appendix Z 1.)

2. Operating and care of Lock No. 2, Mississippi River between St. Paul and Minneapolis, Minn.—The lock and dam were completed in 1906, and their maintenance and operation have been provided for since July 1, 1907, by allotments from the appropriation for "Operating and care of canals and other works of navigation." The amount expended to June 30, 1912, is $13,000.57, of which $2,377.12 was expended during the fiscal year ending June 30, 1912.

Lock and Dam No. 2 is the first of a series of two between St. Paul and Minneapolis, Minn., the object of which was to provide slack-water navigation over the stretch of river between Minnehaha Creek and the Washington Avenue Bridge, Minneapolis, Minn. No. 2 is the upper one of the series and was constructed first because navigation on the section above was difficult and hazardous under the most favorable conditions and virtually impossible at low stages of the river.

The river and harbor act approved June 25, 1910, modified the project for improving the Mississippi River between St. Paul and Minneapolis by providing for an increase in the proposed height of Lock and Dam No. 1. When the project is completed that lock and dam will be sufficient for navigation purposes between the two cities and Lock and Dam No. 2 will not then be needed.

For commercial statistics see Mississippi River between St. Paul and Minneapolis, Minn.

(See Appendix Z 2.)

3. Reservoirs at headwaters of Mississippi River.—These are intended to improve navigable depths on the Mississippi River above Lake Pepin. Before improvement the river was subject to fluctuations of level between wide limits and was often unnavigable at low stages.

The project adopted in 1880 called for the construction of 41 reservoirs in Minnesota and Wisconsin to collect surplus water from the precipitation of winter, spring, and early summer, and release it systematically during low water so as to benefit navigation on the Mississippi River. The estimated cost, exclusive of land and flowage easements, was $1,809,083.

In compliance with act of Congress of August 5, 1886, the Chief of Engineers, in 1887, recommended that the reservoirs originally contemplated on the St. Croix, Chippewa, and Wisconsin Rivers be not constructed. Subsequent acts of Congress have been in accord with this recommendation, and the project is considered as modified to the extent recommended. (See Annual Report of the Chief of Engineers for 1887, pp. 1681 et seq.)

The act of March 2, 1907, authorized the construction of a reservoir at Gull Lake, Minn., at an estimated cost of $70,000, provided that the necessary land and flowage easements be acquired without cost to the United States. The same act authorized the reconstruction of

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[1] Exclusive of amount available for fiscal year 1913.

Sandy Lake Dam, without a lock for steamboats, at an estimated cost of $75,000. This provision was amended by section 5 of an act (Public, No. 153) approved May 28, 1908, by striking out the words "without a lock for steamboats."

The act approved June 25, 1910, authorized the construction of an equalizing canal between Winnibigoshish and Leech Lake Reservoirs in accordance with House Document No. 363, Sixty-first Congress, second session, at an estimated cost of $61,200, and made an appropriation of that amount. A further sum of $10,000 was appropriated by the act approved February 27, 1911, to provide for the construction of an additional railway bridge over the canal. Since the act was passed the stage of water in Winnibigoshish Reservoir has been too low to permit of work being done along the route selected under the project and there is very little prospect of there being sufficient water next year. Recent developments have demonstrated that the canal could probably be built for the same amount along what is known as the westerly route, commencing at Pike Bay, near Cass Lake, and ending at Steamboat Bay in Leech Lake. This route would have the advantage of being convertible into a navigable canal, if circumstances should ever seem to warrant it. It is recommended that the westerly route be authorized instead of the easterly one now authorized.

The project, therefore, now in force contemplates the construction of six reservoirs (at Winnibigoshish, Leech Lake, Pokegama, Sandy Lake, Pine River, and Gull Lake), and is substantially completed except the canal between Winnibigoshish and Leech Lake Reservoirs. It may be said to be 95 per cent complete.

The total expenditure up to June 30, 1912, was $1,615,922.20, of which $656,805 was for original construction, $723,680 for renewal and maintenance, $154,150 for acquisition of land and flowage rights, including surveys, $1,079.85 for canal, and the remainder for operating expenses, damages, and contingencies.

Under the project five timber dams were built—at Lake Winnibigoshish, Leech Lake, Pokegama Falls, Pine River, and Sandy Lake.

These have been rebuilt in concrete. A concrete dam has also been constructed at Gull Lake and the reservoir is in operation, but there is still a little work to be done on the embankments and a dam tender's dwelling to be built.

Title to 6,122 acres of land has been acquired and flowage rights on 10,214 acres, including 955 acres for the Gull Lake Reservoir.

The expenditure as a whole has resulted in benefit during the low-water season to the navigable portions of the Mississippi River from Cass Lake, Minn., to Lake Pepin, and incidentally in the mitigation of the floods in the river above St. Paul. The chief benefit has probably been to commerce on the Mississippi River from St. Paul down.

The effect on freight rates has been considerable, both on the upper river and below St. Paul. Without the reservoirs steamboat transportation would scarcely be possible during low water between Brainerd and Grand Rapids, and freight would have to be carried by wagons at great expense. It is a fact that railroad freight from St. Paul to St. Louis, a distance of 600 miles, is only 5 per cent higher than the rate from St. Paul to Chicago, 400 miles; and that steamboat freight rates to river points below St. Paul are in general about one-third lower than those of the railroads. Some portion of this reduction is doubtless due to the reservoirs.

No additional appropriations are needed for expenditure during the fiscal year ending June 30, 1914. It is proposed to expend the available funds in completing the construction of Gull Lake Reservoir, completing the construction of dikes around Pine River Reservoir, and constructing the canal between Winnibigoshish and Leech Lake Reservoirs.

GENERAL IMPROVEMENT.

July 1, 1911, balance unexpended	$28,745.74
June 30, 1912, amount expended during fiscal year, for works of improvement	1,910.38
July 1, 1912, balance unexpended	26,835.36
July 1, 1912, outstanding liabilities	10.00
July 1, 1912, balance available	26,825.36

CONSTRUCTION OF GULL LAKE RESERVOIR.

July 1, 1911, balance unexpended	$27,893.74
June 30, 1912, amount expended during fiscal year, for works of improvement	18,072.41
July 1, 1912, balance unexpended	9,821.33
July 1, 1912, outstanding liabilities	132.10
July 1, 1912, balance available	9,689.23
Amount appropriated by river and harbor act approved July 25, 1912	15,000.00
Amount available for fiscal year ending June 30, 1913	24,689.23

CANAL BETWEEN LAKE WINNIBIGOSHISH AND LEECH LAKE.

July 1, 1911, balance unexpended	$70,540.45
June 30, 1912, amount expended during fiscal year, for works of improvement	420.30
July 1, 1912, balance unexpended	70,120.15

CONSOLIDATED.

July 1, 1911, balance unexpended	$127,179.93
June 30, 1912, amount expended during fiscal year, for works of improvement	20,403.09
July 1, 1912, balance unexpended	106,776.84
July 1, 1912, outstanding liabilities	142.10
July 1, 1912, balance available	106,634.74
Amount appropriated by river and harbor act approved July 25, 1912	15,000.00
Amount available for fiscal year ending June 30, 1913	121,634.74

(See Appendix Z 3.)

4. Improving Mississippi River between Brainerd and Grand Rapids, Minn.—This stretch of the Mississippi River is 180 miles in length and it is navigable all its length. At each end, however, is a power dam without lock, which prevents its use for navigation in connection with other stretches of the river. Brainerd is about 2,100 miles above the mouth of the river.

Work of snagging, bowlder removal, etc., on this part of the river was formerly done under a project, now expired, for "Improving Mississippi River above the Falls of St. Anthony." By act of June 13, 1902, this improvement was added to the project for "Reservoirs at headwaters of Mississippi River" and during the fiscal years 1902 to 1909, inclusive, was included in annual reports for that work. Under this project $19,000.96 was expended. As a result the channel between Brainerd and Grand Rapids was greatly improved by removal of snags and overhanging trees, bowlders, etc., but has again deteriorated.

The river and harbor act approved June 25, 1910, adopted a project for completing this improvement at an estimated cost of $22,555. This project aims at securing a practicable channel not less than 3.5 feet deep at mean low water between Brainerd and Grand Rapids by means of dredging, wing dams, and cut-offs, in accordance with plan printed in House Document No. 607, Sixty-first Congress, second session.

During the year the working plant was completed and dredging and removal of snags, etc., from the channel begun.

The amount expended under this project to June 30, 1912, was $17,232.25.

This project is 75 per cent completed.

The maximum draft that can be carried at low water on the Mississippi River above Brainerd depends upon the manipulation of the reservoirs. The amount of water discharged varies with the requirements of navigation, but a depth of 4 feet could probably be maintained throughout the low-water season if necessary. The actual draft that could be carried on June 30, 1912, was 4 feet.

The usual variation in level is about 10 feet. Cass Lake, 283 miles above Brainerd, is the head of navigation.

There are three steamboats and several launches operating on the Mississippi River between Brainerd and Grand Rapids. During the season of 1911 these boats carried about 1,500 short tons of miscellaneous freight, of an estimated value of $90,000, and about 1,050 passengers. In addition to the above about 150,000,000 feet b. m. of loose logs and rafts of hardwood, poles, and pulp wood were floated over this section of the river. The combined weight of the last two items was about 675,000 short tons and the value about $3,000,000.

There are no railroads paralleling the portion of the river under improvement, and inhabitants of the adjacent country are dependent upon the river as a means of transportation. The work of improvement has given a safer and more commodious channel and has doubtless kept down freight rates on the river.

It is believed that the funds available will be sufficient for the completion of the project.

July 1, 1911, balance unexpended	$17,740.77
June 30, 1912, amount expended during fiscal year, for works of improvement	12,418.02
July 1, 1912, balance unexpended	5,322.75
July 1, 1912, outstanding liabilities	1,039.52
July 1, 1912, balance available	4,283.23

(See Appendix Z 4.)

5. Operating and care of reservoirs at headwaters of Mississippi River.—Before 1894 the expenses of operation were paid from the appropriations for construction. By act of August 18, 1894, the "care, preservation, and maintenance" of the reservoirs were included under the appropriation for "Operating and care of canals and other works of navigation." Annual allotments have since been made from that appropriation.

The care, preservation, and maintenance of the reservoirs include repairs to dams, dikes, buildings, roads, telephone lines, etc., and the payment of salaries to dam tenders and gauge readers.

The reservoirs are operated mainly with a view to the improvement of navigation on the Mississippi River, but with due regard to other legitimate interests. Incidentally they are of great benefit in mitigating floods and in regulating the flow of water for power purposes. For rules governing operations see Report of the Chief of Engineers for 1910, Part I, page 635.

The total amount expended up to June 30, 1912, was $405,812.03,[1] of which $48,281.31 was expended during the past year. As a result the river has been maintained during the summers of most years at a navigable stage in its upper portion and from St. Paul to Lake Pepin. Flood heights in the Mississippi have been reduced, often by several feet, and the benefit to manufacturing interests, due to the more uniform flow, has been very great.

For capacities of reservoirs, maps of region, and comparison of rainfall and run-off, see Annual Reports of the Chief of Engineers for 1896, page 1841, and for 1905, page 1678. For break in Pine River Reservoir, see Annual Reports of the Chief of Engineers for 1896, page 1844, and for 1897, page 2144. For diagrams showing how much water had been stored each year in each reservoir, see Annual Report of the Chief of Engineers for 1900, part 4, page 2798. For distribution of liabilities incurred during the fiscal years 1898 to 1905, see Annual Report of the Chief of Engineers for 1905, pages 1676–1677. For report of Board of Engineers upon matters connected with the operation of the reservoirs, see Annual Report of the Chief of Engineers for 1906, part 2, page 1443.

July 1, 1911, balance unexpended	$29, 192. 25
Amount allotted July 18, 1911	32, 000. 00
	61, 192. 25
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	48, 281. 31
July 1, 1912, balance unexpended	12, 910. 94
July 1, 1912, outstanding liabilities	10, 311. 43
July 1, 1912, balance available	2, 599. 51

(See Appendix Z 5.)

6. St. Croix River, Wis. and Minn.—The source of the St. Croix is in small lakes in northern Wisconsin. The river is about 160 miles in length, flowing generally in a southerly direction and emptying into the Mississippi River at Prescott, Wis. It is navigable from its mouth to Taylors Falls, Minn., a distance of about 52 miles. Navigation above that is interrupted by power dams.

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[1] The amount reported as expended last year should have been $357,530.72, an error of 30 cents having been made by erroneously crediting a deposit of that amount.

Before improvement the ruling low-water depth on the bars above Lake St. Croix was 2 feet. In Lake St. Croix the channel was in most places 8 to 10 feet deep, but narrow and tortuous.

The project was adopted in 1875, and amended as to estimates of cost in 1882 and 1889. By act of June 3, 1896, the improvement of the harbor and water front of Stillwater was added to the project.

The end sought was to provide a commodious channel 3 feet deep at low water from Taylors Falls to the Mississippi River, a distance of 52.3 miles, and to give adequate harbor facilities at Stillwater. This was to be done by means of dredging in Lake St. Croix and at Stillwater and by dredging and contraction works above Lake St. Croix. The estimate of cost, as finally modified, was $136,700. The project was completed in 1900.

Since that time work of maintenance has been done. The appropriations have not been sufficient to accomplish all that was desired. and the channel above Lake St. Croix has deteriorated so as to be scarcely navigable at low stages. This deterioration is mainly due to the choking of the river by snags and sunken logs.

No work was done during the year.

The amount expended to June 30, 1912, was $156,429.73,[1] of which the amount spent since 1900, $25,349.24, was for maintenance only.

The maximum draft that could be carried June 30, 1912, at low water was 4 feet at and below Stillwater. Above Stillwater it was not more than 2 feet, the river being about at its mean low summer stage.

Taylors Falls, about 52 miles from its mouth, is the head of navigation on this stream. The usual variation of level of water surface is about 6 feet.

The commerce of this river is chiefly in logs, which are floated loose to Stillwater, Minn., and rafted below that place. About 18,000,000 feet b. m. of loose logs were floated during the season of 1911, their weight being about 81,000 short tons and their value about $396,000. About 18,000,000 feet b. m. of logs and manufactured lumber were rafted below Stillwater, weighing about 25,000 tons, and their value being about $600,000.

The steamer *Morning Star* operated between the mouth and Stillwater in connection with her trips between Davenport, Iowa, and St. Paul. About 2,000 passengers were carried.

No freight to speak of has been carried on the river in recent years. The work done has had no effect on freight rates.

Reports on examinations of this river have been published as follows: Ordered by act of June 23, 1874, Executive Document No. 75 (pt. 6), Forty-third Congress, second session; report dated January 26, 1880, Report of the Chief of Engineers for 1880, page 1661; ordered by river and harbor act of September 19, 1890, Annual Report of the Chief of Engineers for 1891, page 2218; ordered by river and harbor act of March 3, 1899, Annual Report of the Chief of Engineers for 1900, page 2837; ordered by river and harbor act of March 3, 1905, House Document No. 686, Fifty-ninth Congress, first session.

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[1] This amount reduced from that given in last year's report as the expenditures for the year were less than the amount received for machinery sold.

July 1, 1911, balance unexpended	$1,806.26
Proceeds of sale of machinery	700.00
	2,506.26
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	370.99
July 1, 1912, balance unexpended	2,135.27
July 1, 1912, outstanding liabilities	15.70
July 1, 1912, balance available	2,119.57

(See Appendix Z 6.)

7. *Minnesota River, Minn.*—This river has its source in South Dakota, about 35 miles from Browns Valley, Minn. It is about 400 miles in length, its general direction of flow being easterly, and it empties into the Mississippi River at St. Paul, Minn.

Little Rapids, 36 miles from the mouth, may be considered the head of navigation at present, although at high stages navigation is possible to Le Sueur, 88 miles from the mouth.

Before improvement the ruling low-water depth at the entrance to Minnesota River was not more than 2 feet. From the mouth to Shakopee, a distance of 23.7 miles, there was a least low-water depth of 7 feet, and from Shakopee to Little Rapids, 11.8 miles, a least depth of 3 feet. From Little Rapids to Mankato, a distance of 78.2 miles, the river was navigable only at the higher stages. Above Mankato navigation was possible only at very high water. Along the entire course the channel was obstructed by bowlders, snags, and overhanging trees.

The project, adopted in 1867, provided for the removal of snags, bowlders, etc., from Yellow Medicine River to the mouth, a distance of 237 miles. The estimate of cost was $117,000. In 1893 the project was modified to include the construction of a low-water dam across the mouth of the river at Pike Island and the excavation of a new channel through Fort Snelling Chute at the head of Pike Island. When the Minnesota River is low, the Mississippi River, at the head of Pike Island, is ordinarily higher than the Minnesota, and the object of the dam and new channel was to raise the level of the Minnesota at and near Little Rapids during low stages as well as to provide a better entrance. The estimated cost of the new work was $10,000. The project was completed in 1895. Work done since that time has been in maintenance of the channel at the mouth.

By act of June 13, 1902, $2,500 was appropriated for the removal of the dam at Pike Island, should the Secretary of War in his discretion so determine. The dam was removed in 1908.

No work was done during the year.

The amount expended to June 30, 1912, was $144,327.47, of which $12,828.22 was for maintenance of existing improvements.

Appropriations since 1896 have been very small and irregular, and have all been applied to the maintenance of the improvement at or near the mouth of the river.

The maximum draft that could be carried to Shakopee June 30, 1912, was 4 feet.

The stream is at present used chiefly by excursion steamers and small pleasure launches.

The improvement of the Minnesota River has as yet had no effect on freight rates, as vessels of commercial size have not been able to enter it.

For historical sketches see Annual Report of the Chief of Engineers for 1879 and 1894, pages 1182 and 1725, respectively.

For description and physical characteristics see Report of the Chief of Engineers for 1875, page 381. Reports of examinations have been published as follows: Executive Document No. 76, Forty-third Congress, second session; Executive Documents Nos. 249 and 1335, Fifty-third Congress, second session; Report of the Chief of Engineers for 1895, pages 2206 and 2208; Report of the Chief of Engineers for 1897, page 1834; Report of the Chief of Engineers for 1900, page 2834; Report of the Chief of Engineers for 1904, page 2260; House Document No. 493, Sixtieth Congress, first session.

July 1, 1911, balance unexpended	$1,921.78
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	70.57
July 1, 1912, balance unexpended	1,851.21

(See Appendix Z 7.)

8. Red River of the North, Minn. and N. Dak.—This river has its source at the confluence of the Bois de Sioux and Otter Tail Rivers at Breckenridge, Minn. From there it flows in a northerly direction into Canada. Its length from source to international boundary is about 400 miles. The actual head of navigation is Bellmont, N. Dak., about 180 miles from the international boundary. Above Bellmont navigation is obstructed by numerous low fixed bridges.

Under this project are included the improvement of the Red River of the North, Minn. and N. Dak., and of Red Lake River, Minn.

Before improvement the ruling depth at low water in the Red River of the North from the Canadian frontier to Grand Forks, a distance of 143.5 miles, was 2 feet, and from Grand Forks to Moorhead, 155 miles, 1.5 feet. From Moorhead to Breckenridge, 97 miles, navigation was possible only at the higher stages. The river was obstructed by snags, overhanging trees, etc.

Red Lake River from the head of Red Lake to Thief River Falls, a distance of 135 miles, had a low-water depth of at least 3 feet in most places, but was obstructed by a bar at the mouth of the lake and by bowlders between Thief River Falls and High Landing, a distance of 35 miles, so that the ruling depth was 1.5 feet.

The project for the Red River, adopted in 1878, provided for dredging and removal of obstructions from Breckenridge to the international boundary and the construction of a lock and dam to overcome the fall at Goose Rapids, the whole being with a view to obtain channels as follows:

Breckenridge to Moorhead, 97 miles, a channel capable of being navigated during high and medium stages of water.

Moorhead to Grand Forks, 155 miles, a channel 50 feet wide and 3 feet deep at low water.

Grand Forks to the northern boundary line, 143.5 miles, a channel 60 feet wide and 4 feet deep at low water.

The estimated cost was $364,598.17. This project was modified as follows: In 1883 the estimated cost was increased to $398,598.17. In 1887 the proposed lock and dam at Goose Rapids was dropped from the project and the estimate reduced to $252,598.37. In 1893 the estimate was increased to $310,320.

The improvement of Red Lake River was added to the project in 1896. It was proposed to provide a depth of 3 feet by dredging and removal of bowlders from Thief River Falls to the head of Red Lake.

The amount authorized by Congress to be spent on this work was $9,000. The total estimate for both rivers is therefore at present $319,320. This addition to the project is completed.

The project at present in force contemplates channels of the dimensions given above from Breckenridge to the Canadian frontier, at an estimated cost of $310,000. It has never been more than two-thirds completed.

During the year the channel in the vicinity of Grand Forks was dredged where necessary, nearly 60,000 cubic yards being removed. Owing to lack of funds work was suspended June 15, 1912.

The total amount expended to June 30, 1912, was $360,142.17, of which $57,888.07 was for maintenance.

As a result of these expenditures some improvement was made in the few years subsequent to 1878 in the upper section of the river. No work has been done in this section in recent years because there has been no navigation. In the middle section the project was completed, except for 13 miles, in 1894. Since that time the river above Bellmont, N. Dak., has been obstructed by unauthorized bridges which do not permit navigation. In the lower section the project was completed in 1902.

Since the shoals in this river constantly recur, annual work of maintenance is necessary. The funds supplied not having been sufficient to maintain depths contemplated by the project, the navigable depth of the middle section is now 2 feet and of the lower section 3.5 feet. Nothing beyond work of maintenance has been done in recent years; this has been confined to dredging the worst bars in the vicinity of Grand Forks, N. Dak. The expenditure of at least $7,500 annually is required to keep the navigated portions of the river in condition.

On Red Lake River work has been confined to the removal of snags, bowlders, and similar obstructions from the channel. No work has been done since 1900, and in 1905 the floating plant used for this work was sold by authority of the Secretary of War.

The maximum draft that could be carried on June 30, 1912, north of Bellmont was 2½ feet, the river being 1 foot below its mean low summer stage. The usual variation of water surface is 25 feet; the maximum variation, 49 feet.

Red Lake River is navigable from Thief River Falls to the head of Red Lake, a distance of 135 miles. The maximum draft that could be carried on June 30, 1912, was 3 feet. Below Thief River Falls the river is not navigable. The usual variation of level is about 3.5 feet; the maximum variation about 6 feet.

Red River is regularly used during the summer season by two steamboats and 11 barges. During the season of 1911 about 3,000 short tons of wheat, lumber, and other merchandise and about 1,550 passengers were carried.

About 31,000,000 feet b. m. of logs were floated down Red Lake River during the season of 1911, their weight being 140,000 short tons and their value $500,000.

Rates on the Red River steamers are from 70 to 50 per cent less than the railroad rates between common points, but the project has no apparent effect on railroad freight rates.

It is proposed to apply the amount required for expenditure for the fiscal year 1914 in dredging near Grand Forks, N. Dak., and removing snags and other obstructions.

For physical characteristics see Annual Reports of the Chief of Engineers for 1874, page 295; 1875, page 370; 1878, page 730; 1879, page 1192. For plans of improvements see Annual Reports of the Chief of Engineers for 1874, page 297; 1879, page 1191; 1881, page 1757. For revisions of projects see Annual Reports of the Chief of Engineers for 1883, page 1450; 1887, page 1712. For description of large landslide caused by Northern Pacific Railroad embankment see Annual Report of the Chief of Engineers for 1898, page 1831. References to reports on examinations ordered by the river and harbor acts of March 3, 1905, and March 2, 1907, will be found in the Annual Report of the Chief of Engineers for 1906, part 1, page 483, and for 1908, part 1, page 542.

Report of the examination of Red Lake River ordered by the river and harbor act approved March 3, 1909, is printed in House Document No. 483, Sixty-first Congress, second session.

July 1, 1911, balance unexpended	$7,745.32
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	6,764.49
July 1, 1912 balance unexpended	980.83
July 1, 1912, outstanding liabilities	477.51
July 1, 1912, balance available	503.32
Amount appropriated by river and harbor act approved July 25, 1912	17,000.00
Amount available for fiscal year ending June 30, 1913	17,503.32
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 7,500.00

(See Appendix Z 8.)

9. *Warroad Harbor and Warroad River, Minn.*—Before improvement there was a good natural harbor of moderate depth at the mouth of Warroad River. Between the harbor and the river there was a bar having a least depth of 3.5 feet at ordinary lake stage (7.2 feet on the gauge) and between the harbor and the lake a bar having a least depth of 5 feet at ordinary lake stage. The channel of the Warroad River from the harbor to the steamboat landing (about 1 mile) was deep, but tortuous.

The river and harbor act of 1899, as amended by the act approved June 6, 1900, appropriated $3,000, or so much thereof as might be necessary, for improving the mouth of Warroad River, Minn. Nothing was done under this appropriation beyond making an examination and survey.

The present project was adopted in 1902, and provided for building a dredge and dredging in the harbor a channel sufficient for boats drawing 7 feet of water. The estimated cost was $45,000. This project was modified in 1905 so as to provide for a channel 100 feet wide and 7 feet deep from the inner end of the harbor channel to the boat landing at Warroad, with a turning basin for boats at the inner end, at an estimated cost of $35,000. The project was further modified by the river and harbor act of June 25, 1910, in accordance with plan printed in House Document No. 703, Sixty-first Congress, second session, which provided for enlarging the turning basin so as to be 900 feet by 500 feet, at an estimated cost of $5,700, with $2,000 annually for maintenance thereafter. The total estimate is therefore $85,700. The river and harbor act of July 25, 1912, again modified the project so as to provide for deepening the channel by securing and maintaining a depth of 8 feet, $13,200 being appropriated therefor.

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[1] Exclusive of amount available for fiscal year 1913.

No work was done during the year.

The total amount expended to June 30, 1912, was $98,281.54, of which $24,850.15 was for work of maintenance. The project is completed.

The maximum draft that could be carried on June 30, 1912, was 6½ feet, the water being 3 feet below mean summer level.

The head of navigation on Warroad River is at the steamboat landing about a mile above the mouth.

The bars in this harbor are formed by wave action, and constantly recur. Annual dredging is therefore necessary for maintenance. It is estimated that $2,000 should be expended each year in work of maintenance.

The difficulty had in using the channel during the past two years was due to unusually low water in the lake, which appears to have been caused by the operation of dams maintained by water-power companies and lumbermen at the outlet of the lake on the Canadian side and in its tributaries, and the matter has been brought to the attention of the State Department for consideration by the International Joint Commission having jurisdiction over boundary waters. Should Congress desire that the project depth be maintained at such unusually low stages of water, this result can probably be accomplished most promptly by additional dredging. This difficulty will be overcome by securing the increased project depth authorized by the act of 1912.

During the season of 1911 the commerce amounted to 2,400 short tons of miscellaneous freight, valued at $214,000. There were also about 4,000,000 feet b. m. of logs towed; weight, 18,000 short tons; value, $80,000. Boats using the harbor carried about 9,200 passengers. The value of the business done could not be obtained.

This improvement has no effect on railroad freight rates. There are no railroads in competition with steamers on the lake.

The examination ordered by the river and harbor act of March 3, 1909, is printed in House Document No. 703, Sixty-first Congress, second session.

The amount estimated for the fiscal year 1914 will be applied to maintenance.

July 1, 1911, balance unexpended	$1,193.68
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	775.22
July 1, 1912, balance unexpended	418.46
July 1, 1912, outstanding liabilities	20.00

July 1, 1912, balance available	$398.46
Amount appropriated by river and harbor act approved July 25, 1912	13,200.00
Amount available for fiscal year ending June 30, 1913	13,598.46
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 2,000.00

(See Appendix Z 9.)

10. Zippel Bay, Lake of the Woods, Minn.—Zippel Bay is situated on the southern shore of the Lake of the Woods, about 26 miles by water from Warroad Harbor on the west and about 10 miles from the mouth of Rainy River on the east.

Before improvement the natural harbor at the inner end of Zippel Bay was connected with the bay by a long, tortuous channel about 75 feet wide, varying in depth from 4 to 6 feet. This channel is now practically closed.

The river and harbor act of February 27, 1911, adopted a project for improvement which contemplates dredging a channel through the bar separating the harbor from the bay 200 feet wide and 10 feet deep at mean summer level of Lake of the Woods (7.2 feet on the Warroad gage), and building a jetty 2,800 feet long for the protection of this channel, and also to serve as a breakwater for an outer anchorage area, the estimated cost being $27,781. See House Document No. 1276, Sixty-first Congress, third session.

This project has never been modified.

During the year the material for the breakwater was assembled and the greater portion of it placed. It is expected to complete the project next year, after which work of maintenance will be necessary, the estimated cost being $1,000 annually.

The amount expended to June 30, 1912, $17,567.08.

The maximum draft that can be carried June 30, 1912, is nothing, the stage being nearly 3 feet below the mean summer level of the lake, which is 7.2 on the Warroad gauge, and very little dredging has been done.

Zippel River flows into the bay and is navigable for boats of light draft for a distance of 5 miles above the mouth.

During the season of 1911 the commerce of Zippel Bay amounted to 420 tons of miscellaneous freight. There were also carried 3,650 passengers.

There is no railroad near Zippel, and the improvement, therefore, has no effect on freight rates.

The examination ordered by the river and harbor act of March 3, 1909, is printed in House Document No. 1276, Sixty-first Congress, third session.

The amount estimated for the fiscal year 1914 will be applied to maintenance.

July 1, 1911, balance unexpended	$27,381.00
June 30, 1912, amount expended during fiscal year, for works of improvement	17,167.08
July 1, 1912, balance unexpended	10,213.92
July 1, 1912, outstanding liabilities	1,951.37

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[1] Exclusive of amount available for fiscal year 1913.

July 1, 1912, balance available	$8,262.55
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]1,000.00

(See Appendix Z 10.)

11. Survey of Otter Tail Lake and Otter Tail River and Red Lake and Red Lake River, Minn., and of Big Stone Lake and Lake Traverse, Minn. and S. Dak.—The river and harbor act approved June 13, 1902, provided for the continuation of these surveys, which were ordered by Congress with a view to the construction of reservoirs for the improvement of the navigation of Red River of the North and Minnesota River.

Preliminary reports were submitted in April, 1900, and are printed in the Annual Report of the Chief of Engineers for 1900, pages 2828–2836. A final report was submitted August 11, 1903, and printed in the Annual Report of the Chief of Engineers for 1904, page 2260 et seq.

Amount expended on all projects to June 30, 1912, $17,293.28.

It is proposed to reserve the available funds for the purpose of making hydrological observations during the next flood affecting these localities.

July 1, 1911, balance unexpended	$8,206.72
July 1, 1912, balance unexpended	8,206.72

(See Appendix Z 11.)

12. Lake Traverse, Minn. and S. Dak.—Lake Traverse is situated in the northeast corner of South Dakota and forms part of the boundary line between that State and Minnesota. It is the source of the Bois de Sioux River, which, in turn, is one of the sources of the Red River of the North. It is about 25 miles long, lying generally northeast and southwest, and has an average width of 1½ miles. It is divided by narrows into an upper and lower basin, 19 miles and 6 miles long, respectively. The upper or main basin is in good navigable condition, with ample depth of water except for certain bowlder reefs, which are dangerous at night or in fogs. Nothing is needed here beyond suitable channel marks. The lower basin is in large part shallow and obstructed by acquatic vegetation, but there are winding channels with depths in most places of from 5 to 7 feet. The channel between the two basins is about a mile long, winding, 3 to 5 feet deep and not less than 100 feet wide except in one place where the width is 20 feet. This is an effective bar to navigation on the lower basin except for rowboats.

The original and existing project is contained in House Document No. 1391, Sixty-first Congress, third session, which contains a map of the locality. It provides for dredging a channel through the narrows, about 11,500 feet long, 50 feet wide at bottom, with side slopes of 2 on 1, and 4 feet deep at mean low water. The estimate of cost is $7,510. This project was adopted by the river and harbor act of July 25, 1912.

There has been no modification of this project.

No work has been done as the project was not adopted until after the close of the fiscal year.

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[1] Exclusive of amount available for fiscal year 1913.

The maximum draft that could be carried June 30, 1912, was 2¼ feet at mean low water. The usual variation of level of water surface is about 4 feet, with a maximum of 8 feet. The head of navigation is the southerly end of the lake, the head of the upper basin.

There was practically no navigation on the lake prior to September, 1907. Since then a rapidly growing business has developed, and in 1908 the commerce aggregated 140,000 ton-miles of freight, mostly wheat, besides a passenger traffic of over 8,500 passenger miles. In that year the traffic was carried on with one 60-ton freight boat and an 80-ton barge, together with a 30-passenger launch. In 1909 the commerce amounted to 180,000 ton-miles of freight and 10,000 passenger miles, besides considerable traffic in cream, butter, and eggs, of which no figures could be obtained. No statistics have been furnished since 1909.

The project can have no effect on freight rates.

It is believed that the amount estimated for the project will be sufficient to complete it.

Amount appropriated by river and harbor act approved July 25, 1912	$7,510
Amount available for fiscal year ending June 30, 1913	7,510

(See Appendix Z 12.)

13. Gauging Mississippi River at or near St. Paul, Minn.—This work is provided for by allotment from the permanent annual appropriation of $9,600 made by the river and harbor act of August 11, 1888, as amended by section 9 of the river and harbor act of June 13, 1902, for the purpose of securing the uninterrupted gaugings of the waters of the Mississippi River and its tributaries. No gaugings were made until the fall of 1899. Since then gaugings have been made as frequently as the funds available would permit and the conditions justified the expenditure. For location of gauges, see map facing page 1832, Report of the Chief of Engineers for 1898.

Tables showing relation of rainfall to run-off in the Mississippi Valley above St. Paul are printed on page 2169, Report of the Chief of Engineers for 1897. The slope of the Mississippi River between Minneapolis and St. Paul is shown in the Report of the Chief of Engineers for 1900, page 2823.

The amount expended to June 30, 1912, is $8,032.58.

(See Appendix Z 13.)

EXAMINATION AND SURVEY OF MINNESOTA RIVER, MINN., MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

Reports dated April 27, 1909, and December 14, 1910, on preliminary examination and survey, respectively, *of Minnesota River, Minn.; also with a view to ascertaining whether, for the maintenance of navigation, storage reservoirs are necessary at or near the headwaters of said river, and to determine what portion of the cost of said improvement should be borne by owners of water power and others,* required by the river and harbor act approved March 3, 1909, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 700, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $1,500,000 for first construction, with $3,000 annually for maintenance, is presented, provided that the State or other local interests bears one-half the estimated first cost ($750,000), and that the operation of the Lac qui Parle Reservoir be left entirely to the United States.

EXAMINATIONS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations, required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officers. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. *Preliminary examination of Mississippi River, Minn., with a view to the removal of a ledge in Aitkin County, at or near Pine Knoll.*—Report dated December 28, 1910, is printed in House Document No. 282, Sixty-second Congress, second session. The improvement of this locality in the manner apparently desired is not deemed worthy of being undertaken by the United States at the present time.

2. *Preliminary examination of Red River of the North and its headwaters in Minnesota and North Dakota, with a view to determining whether storage reservoirs are necessary in the interest of navigation.*—Report dated August 2, 1911, with map, is printed in House Document No. 616, Sixty-second Congress, second session. The improvement of this stream by the United States in the manner desired is not deemed advisable at the present time.

3. *Preliminary examination of St. Croix River at Afton, Minn.*—Report dated November 7, 1910, with map, is printed in House Document No. 422, Sixty-second Congress, second session. The improvement by the United States of this locality in the manner proposed is not deemed advisable at the present time.

The local officer was also charged with the duty of making other preliminary examinations and surveys required by the river and harbor acts approved June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. *Rainy River, Minn.*, with a view to removing obstructions in the channel at Rainier.
2. *Harbor and channel at St. Paul, Minn.*
3. *Mississippi River, Minn., between Winnibigoshish and Pokegama Reservoirs; and from Leech Lake Dam to the mouth of Leech River*, with a view to straightening and improving the channel.
4. *Lake of the Woods, at or near Arnesen, Minn.*, with a view to securing increased harbor facilities.

IMPROVEMENT OF RIVERS AND HARBORS IN THE KANSAS CITY, MO., DISTRICT.

This district was in the charge of Maj. Edward H. Schulz, Corps of Engineers. Division engineer, Lieut. Col. Charles L. Potter, Corps of Engineers.

1. *Missouri River.*—(*a*) *General improvement.*—The Missouri is formed by the junction of the Jefferson, Madison, and Gallatin Rivers, in southwestern Montana, and flows in a general south-

easterly direction, entering the Mississippi River in the eastern part of Missouri, about 18 miles above St. Louis, Mo. The distance from Three Forks to the mouth is 2,551 miles. The portion of the river from Fort Benton to Great Falls, 49 miles, consists of dams and rapids, the aggregate fall being about 695 feet. Some portions of the river above Great Falls are also navigable, but not continuously, owing to the existence of several power dams.

The Missouri River has been navigated by steamboats since 1819; first boat to Council Bluffs, 1819; first to mouth of Yellowstone, 1832; first to head of navigation, Fort Benton, Mont., 1859.

The elevations of low water above sea level are as follows:

Three Forks, 3,045 feet; Fort Benton, 2,671 feet; Sioux City, 1,085 feet; Kansas City, 723 feet; and mouth of Missouri River, 386 feet.

The original condition of the river was, and to a great extent the present condition is, one of alternate pools and bars. The low-water depth over the bars is about 3 feet and the width of the river at such places is from one-third to 1 mile. In the deep reaches the width is 800 to 1,500 feet, and the low-water depth in such places is often over 12 feet. Generally speaking, the navigable low-water depth of unimproved river is 3 feet and of high water only 9 feet. The navigable depth does not increase as rapidly as the water height, since the bars rise with the stage of river. The river is also encombered with snags, which, however, are getting fewer, due to constant snagging operations.

No project for the improvement of the river as a whole has been adopted.

Government work on the river in the removal of snags began as early as 1838 and continued thereafter, under annual appropriations (for the most part made jointly for the Ohio, Mississippi, Missouri, and sometimes the Arkansas Rivers), with occasional intermissions, for the next 40 years. Prior to 1878 one or two small appropriations had been made for general improvement, but it was with the act of June 18 of the latter year that appropriations began on a large scale.

The work prior to 1884 was carried on under separate districts.

A project for the river from Sioux City to the mouth was adopted in 1884, the improvement to consist of rectification, revetment, and snagging. In 1890 the project was modified by systematic improvement of the first reach, from Jefferson City to the mouth.

From 1884 to 1890 the work on the entire river was under the Missouri River Commission. After 1890 that portion above and including Sioux City, Iowa, was under a separate district until 1902. Since the discontinuance of the Missouri River Commission the works on the entire river have been consolidated under one district.

The greater part of the work on the portion of the river below Sioux City has been done by the Missouri River Commission, reporting to the Chief of Engineers. The commission was constituted by act of Congress of July 5, 1884, and was abolished by the river and harbor act of June 13, 1902.

On the portion of the river above Sioux City the work has been done under the immediate charge of officers of the Corps of Engineers, except during the period from 1884 to 1890, when it was in the charge of the Missouri River Commission.

In addition to the foregoing work a fleet of snag boats has been in operation clearing the channel of snags and other obstructions on the portion of the river where boats have been running. This work is considered to be directly beneficial to navigation.

The amount expended on the various portions of the river prior to existing projects is as follows:

Mouth to Kansas City, excluding appropriations of June 25, 1910, and thereafter, $7,227,934.12.

Kansas City to Sioux City, including appropriation of June 25, 1910, $2,547,046.52.

Sioux City to Fort Benton and above, including appropriation of June 25, 1910, $2,778,458.73.

Total expenditures on entire Missouri River to present approved projects, $12,253,859.03; and for entire river to June 30, 1912, $13,166,887.58.

The result of these expenditures and improvements has been to demonstrate the possibility of regulating the river in such manner as to make it navigable for a channel of commerce; that the cost of such regulation would be very great; and that no permanent good to through navigation can be accomplished by appropriations for specific localities not so connected as to form part of the systematically improved reaches. The result of the expenditures at separated localities has been beneficial locally by protecting the banks and forming good navigable water fronts and incidentally preserving private property from the ravages of the river, but has given little, if any, encouragement to through navigation.

At the localities under improvement an effort has been made to maintain the existing and prevailing depth of channel. The least depth at mean low water over the shoalest part at the localities under improvement is not less than 6 feet. The usual variation of level of water is about 8 feet at Fort Benton, 19 feet at Kansas City, and 25 feet at St. Charles.

The maximum draft June 30, 1912, at mean low water from Kansas City to mouth is 4 feet, from Kansas City to Sioux City, 3½, and from Sioux City to Fort Benton 3 feet. The head of navigation is Fort Benton, 2,285 miles above the mouth.

The effect of the improvement has been to equalize and keep down freight rates, the actual river rates being about 66⅔ per cent of the railroad rates.

A condensed description of the works on the river executed under the supervision of the Missouri River Commission is given in the commission's last annual report (Annual Report of the Chief of Engineers for 1902, Supplement).

A condensed description of the work above the Great Falls will be found in the Annual Report of the Chief of Engineers for 1899, pages 385–386, and in later annual reports; and of the work on the river between Fort Benton and Sioux City in the Annual Report of the Chief of Engineers for 1902, pages 382–385.

A complete survey of the river has also been made, in part by the commission and in part by officers in charge of the districts on the upper portions of the river, and has been published in 83 maps, scale 1 inch to the mile.

The river formerly carried an active commerce, which at one time had been entirely diverted to other channels. This commerce now shows healthy signs of reviving.

Through commerce from Kansas City to the mouth was revived during the season of 1908. Two boats regularly ran from Kansas City to St. Louis.

A million-dollar boat line has been organized at Kansas City and is placing a modern boat service upon the river from Kansas City to St. Louis, with proper wharfage and terminal facilities.

The first trip of the new boat line was made by the steamer *Chester* from St. Louis to Kansas City in June, 1911. The company now has three boats and five barges. The *Chester*, as well as the *A. M. Scott*, are tunnel-screw type, and their operation as to speed and economy and adaptability to the Missouri River needs are being watched with great interest. The company expects to extend the boat service and develop the same as rapidly as conditions allow.

Definite contracts for freight have been made, and proper terminal facilities, including a modern wharf, 500 feet in length, have been constructed at Kansas City, Mo.

Increased commerce and use of the river is also observed in the upper river in the vicinity of Bismarck, N. Dak., and above to the mouth of Yellowstone River.

On this portion of the river freight is carried by boat and barge. The boats, formerly of steam propulsion, are now nearly all equipped with gasoline engines of 50 to 75 horsepower and are of the sternwheel type, have a light draft, and have practically seven-eighths of the deck space available for cargo.

EXISTING PROJECTS.

Mouth to Kansas City—Permanent 6-foot channel.—Project adopted by river and harbor act of July 25, 1912, in accordance with report in House Document 1287, Sixty-first Congress, third session. Cost $20,000,000, with a view to completion in 10 years. For details and other reports on examination, see (*b*).

Kansas City to Sioux City.—No project. Appropriation of $75,000, act of July 25, 1912, made for improvement and maintenance. For details and reports on examinations, etc., see (*c*).

Sioux City to Fort Benton.—Appropriation of $150,000 made for maintenance and improvement, and project adopted by river and harbor act of July 25, 1912, in accordance with report in House Document No. 91, Sixty-second Congress, first session. No completed cost and no time limit. For details and other reports on examinations, see (*c*).

The actual operations during the year have been carried on from appropriations for the various portions of the river, and are reported under (*b*) and (*c*). The expenditures made from funds remaining from appropriation act of March 3, 1909, were for minor freight accounts, office, and supervision.

For details of amounts expended on existing projects, proportions completed, length of improved sections, planes of reference, commerce, effect on freight rates, specific purposes to which additional funds will be applied, money statements, etc., see (*b*) and (*c*).

[Act of Mar. 2, 1907.]

July 1, 1911, balance unexpended	$2,694.86
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,694.86

EMERGENCIES IN RIVERS AND HARBORS.

Wilhoit Bend, Mo.

July 1, 1911, balance unexpended	$156.72
July 1, 1912, balance unexpended	156.72

[Act of Mar. 3, 1909.]

July 1, 1911, balance unexpended	$4,903.28
Received from sale of maps	9.15
	4,912.43
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	4,911.08
July 1, 1912, balance unexpended	1.35

(*b*) *Mouth to Kansas City* (*392 miles*).—The original condition was one of varying widths and depths. The width varies from 800 feet to 1 mile or more. In the deep reaches the width is 800 to 1,500 feet, and the low-water depth often over 12 feet. In the wide reaches the channel divided into numerous chutes, thus reducing the available depth to about 3½ feet to 4 feet at low water. The banks of the river are alluvial and are continuously eroding, and the channel is changing except where protected by revetments and dikes or by natural bluff contacts. The river was also obstructed by many snags.

The present condition is generally similar to the original, except that snags are fewer, and the reaches of deep water are longer and better, due to river regulation and improvement.

The river has been navigated by steamboats since 1819.

Length of entire river from Three Forks to mouth, 2,551 miles. General course southeast.

Length of section, Kansas City to mouth, 392 miles. General course east. Head of navigation, Fort Benton, Mont., 2,285 miles above mouth.

ORIGINAL PROJECT.

The numerous partial projects and improvements carried out on this section of river are given partly under (*a*). The Missouri River Commission was in charge from 1884 to 1902, and undertook various systematic improvements. The effort of the commission in its work below Sioux City was to accomplish a continuous, progressive control of the river, contracting it where necessary, giving the channel proper direction, and securely holding it in place. Work in this direction was done in the vicinity of Kansas City and on the first reach of the river, which extends from near Jefferson City to the mouth. On 45 miles of this reach a continuous channel of not less than 6 feet in depth at low water was obtained on what was originally one of the worst parts of the river, in the vicinity of the mouth of the Osage. In addition to forming a channel, much new land was formed and much land protected from destruction by the river. The greater part of the funds appropriated for expenditure under the direction of the commission was not applicable to the comprehensive plan adopted, and about one-third was diverted to work at separate localities.

The total expenditures to date, from all appropriations made prior to June 25, 1910, amount to $7,227,934.12.

The existing project provides for securing a permanent 6-foot channel between Kansas City and the mouth of the river in accordance with report submitted in House Document No. 1287, Sixty-first Congress, third session, with a view to the completion of such improvement within a period of 10 years. Date of adoption by Congress, river and harbor act of July 25, 1912, which also appropriates $800,000 for continuing work. Estimate of cost, $20,000,000. Time of completion, 10 years. Work proposed, the regulation and contraction of channel by means of revetment and dikes, with a view to securing a permanent 6-foot channel, assisted by removal of snags.

References to examination or survey reports, maps, plans, etc.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Sioux City to mouth (report)					1881	1649
Kansas City to mouth (local points).	House	421	Fifty-seventh	Second		
Kansas City to mouth and Kansas City to Sioux City	do	1120	Sixtieth	do		
Kansas City to mouth	do	1287	Sixty-first	Third		

No modification of existing project has been made. Work has been carried on in accordance with the approved project of July 25, 1912, practically since the appropriation of June 25, 1910.

The work of the past year has been carried on from funds as follows, which covers all the appropriations to June 30, 1912, for the existing project: river and harbor act of June 25, 1910, $1,000,000.

In addition to the above the sundry civil act of August 24, 1912, appropriated $600,000 in pursuance of authorization contained in the river and harbor act of February 27, 1911.

The least depth over the improved reaches at low water is 6 feet. The usual variation of water level at Kansas City is 19 feet, and at St. Charles 25 feet. The maximum through draft at low water is 4 feet.

Elevations referred to St. Louis directrix.

	Kansas City.	St. Charles.
Standard low water	308.67	7.[illegible]
Standard high water	323.19	[illegible]

The effect of the improvement has been to equalize and keep down freight rates, the actual river rates being about 66⅔ per cent of the rail rates.

The status of the work is as follows:

Locality (bends).	Miles above mouth.	Character of work.	Contract or day labor.	Amount done July 1, 1911.	Amount done during fiscal year.	Total to date.	Completed.	Unit cost.
				Feet.	*Feet.*	*Feet.*		
Randolph	384	13,068 feet standard revetment.	Contract	4,000	9,068	13,068	Mar. 23, 1912.	$8.29
Wayne City	376	15,000 feet standard revetment.	do		5,075	5,075		8.09
Liberty	373	12,000 feet standard revetment.	do		1,100	1,100		8.09
Missouri City	360	do	do					9.32
Waverly	297	13,000 feet standard revetment.	do					10.85
Providence	175	14,000 feet standard revetment.	do					8.37
Eureka	167	5,000 feet standard revetment.	Day labor		4,025	4,025		[1] 10.00
Gasconade	110	1,000 feet concrete and willow revetment.	do		1,000	1,000		13.68
Bates Island	98	12,000 feet concrete and willow revetment.	do					[1] 12.00
St. Charles	24	11,000 feet standard revetment.	Contract	110	9,340	9,450		7.74
Commerce Point.	18	4,500 feet concrete dike.	Day labor		140	140		[1] 25.00
Total		96,068 feet revetment.			29,748	33,858		
		4,500 feet dike			140	140		

[1] Estimated.

At the close of the present calendar year there will be about 20 miles of river bank completed, besides the new work begun with the $800,000 appropriated this year. The present season has been unfavorable on account of continued high water. Maintenance and repair work was also constructed during the year as follows:

Locality.	Mile.	Character of work.	Completed.
Waverly Bend	298	One 3-row dike, 100 feet, day labor	July 3, 1911
Glasgow [1]	238	Three 3-row dikes, 620 feet, day labor	Nov. 15, 1911
Eureka	167	Three 3-row dikes, 230 feet, day labor	June 20, 1912
Jefferson City	149	Dike extension, 300 feet, day labor	July 12, 1911
Gasconade	110	Standard revetment, 260 feet, day labor	Oct. 31, 1911

[1] The Chicago & Alton Railway Co. contributed one-half, or $4,167.23, to this work.

These repairs were all made to works constructed prior to adoption of existing project. Total cost, $14,000.

PLANT.

Two steel-hull towboats, 24 by 116 by 5 feet, the *Lieutenant Gurney* and *Lieutenant Augustin*, delivered and accepted at Gasconade, Mo., September 3, 1911. Price, $34,735 each.

Eight steel barges, 24 by 100 by 5 feet, *Nos. 301* to *308*, delivered and accepted at Gasconade, March 23, 1912. Contract price, $5,209 each.

Survey boat, *Katherine*, under construction by day labor at Gasconade boat yard. Gasoline boat, stern wheel, 76 by 20 by 3 feet; length over all, 87½ feet. Estimated cost, $5,000. Material received and keel and framing in place.

Two quarter boats constructed during year by using old barges, 100 by 20 by 5 feet, and part of old quarters. Total cost, $7,745.30.

Two mattress barges, 80 by 30 by 4 feet ½ inch. Total cost, $8,550.

REPAIRS TO PLANT AND BOATYARD.

	Cost.
Mattress barge *No. 14*	$1,690.23
Pile-driver barge *No. 7*	2,690.07

On the snag boat *Missouri* the propelling machinery was overhauled, capstan engines refitted, new wheels built and lined up.

The hulls of 10 barges, 1 pile-driver barge, and 6 pontoons calked. Grader pumps and machinery overhauled. Minor repairs to buildings.

At Gasconade boat yard the machine shops and storehouses were raised to 1 foot above flood line of 1908. About 15,000 cubic yards of sand was pumped toward raising of the yard.

Total expenditures at boat yard, labor, material, and supplies, $17,000.

SNAGGING.

The snag boat *Missouri* was in commission during the working season until June 8, when she was laid up on account of extensive repairs which are needed to strengthen the engine foundations. The snag boat *McPherson* will succeed her during the present season. During the year the following was accomplished by the snag boat *Missouri:*

Miles traveled	2,209
Snags removed	865
Miscellaneous obstructions	15
Trees felled	673

The cost was approximately $29,000.

SURVEYS.

Two survey parties were in the field. The river was covered from mile 368 to 350, 311 to 290, 178 to 142, and 110 to 95; in all, 90 miles. Total surveyed to date, 180 miles. Maps were prepared on a scale of 1 inch equals 1,000 feet.

Improvements during the year other than Government work.

	Feet standard revetment.
Wabash Railroad, mile 354, left bank	1,000
Missouri Pacific Railway, mile 182, right bank	2,000

Total expenditures under existing project, beginning with the appropriation of June 25, 1910, for systematic work on the 6-foot channel, amount to $616,431.56.

This is divided as follows:

New work and surveys	$392,089.57
Maintenance of works	34,213.23
Snagging and snag-boat repairs	46,682.41
New plant and maintenance of plant	143,446.35

Since the adoption of project and beginning with the appropriation of June 25, 1910, there has been expended for snagging and maintenance of works a total of $83,141.87.

The work at Waverly, Providence, and Missouri City Bends is being constructed under continuing contract appropriation of $600,000, authorized February 27, 1911.

The proportion of the approved project accomplished to June 30, 1912, is 6 miles, or 1.5 per cent. By the close of this season it is expected the total completed will be about 5 per cent. Where these revetments have been placed the channel has become fixed and of a greater depth. In general, the depth along a revetted bend is 6 to 10 feet and is free of snags and obstructions. The maximum through draft has not been increased, though the length of the improved channel has increased in proportion as the work progresses.

Amount of freight carried on the Missouri River from mouth to Sioux City, Iowa.

Calendar year—	Short tons.	Calendar year—	Short tons.
1897	391, 029	1905	343, 435
1898	319, 793	1906	573, 348
1899	263, 114	1907	843, 863
1900	277, 306	1908	541, 144
1901	569, 666	1909	840, 810
1902	410, 527	1910	876, 180
1903	750, 291	1911	[1] 859, 721
1904	455, 000		

Amount of freight carried on the Missouri River above Sioux City, Iowa.

Calendar year—	Short tons.	Calendar year—	Short tons.
1887	13, 961	1900	27, 179
1888	12, 895	1901	37, 340
1889	16, 723	1902	31, 070
1890	14, 072	1903	37, 994
1891	14, 211	1904	28, 951
1892	17, 292	1905	52, 956
1893	19, 481	1906	43, 987
1894	37, 936	1907	45, 123
1805	21, 264	1908	17, 517
1896	10, 368	1909	41, 203
1897	17, 105	1910	25, 037
1898	26, 896	1911	11, 290
1899	23. 041		

In high-grade commerce there has been a decided increase; the apparent reduction is in hauling sand. Total mile tonnage for the year was 1,401,805 ton-miles.

The commerce of this section of the river is now in process of change and increase. The Kansas City-Missouri River Navigation Co. has been organized with a capital of about $1,200,000. The first boats of the new company were run during 1911, but actual operations began late in season, and many new features as to navigation, wharfage, terminal transfers, etc., were worked out.

The company has three steel-hull towboats, five barges, and several smaller craft. The combined tonnage of the five barges per foot of immersion is 860 tons. A creosoted pile wharf, 500 feet in length, has been constructed at Kansas City, and a terminal warehouse, 306 feet by 40 feet, built on the wharf, arranged with a locomotive crane and telepherage system of handling freight. This is probably the most complete inland river transfer wharf in the United States. The tonnage handled this season, from May 7 to June 30, aggregates over 1,000 tons for a distance of about 400 miles, or 400,000 ton-miles. Most of this freight was high-class merchandise.

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[1] 307,807 short tons mouth to Kansas City; 51,914 short tons Kansas City to Sioux City.

The company also has a warehouse and wharf at East St. Louis, Ill., and is arranging with the towns on the Missouri River between Kansas City and the mouth for local freight landings. The effect of this revival of commerce has not actually reduced the rail rates, but it is believed such will be the case. The boat rates now in force are about 66⅔ per cent of the rail rates.

The amount estimated as a profitable expenditure for fiscal year 1914 will be applied to continuing work on the approved project.

GENERAL CONSIDERATIONS.

During the past year a good start has been made on the project as adopted by the river and harbor act of July 25, 1912. There are now in force the following works:

	Linear feet.
By contract:	
Standard revetment	78,000
By day labor:	
Standard revetment	5,000
Concrete and willow mattress revetment	12,000
Concrete 3-row dike	4,500

These works will all be finished or well along by January 1, 1913. The funds appropriated by the act of July 25, 1912, $800,000, will be applied to new works of revetment, dike, snagging, and new plant, and should all be under contract or in force by day labor before the summer is far advanced. In addition to the above, 13,068 linear feet of revetment under the approved project has been completed.

Of the 392 miles of river, about 180 miles have been surveyed, and during the present summer an additional 60 miles is contemplated. The combined concrete and willow mattress revetment, as constructed at Gasconade, has proven very satisfactory, and additional similar work on a large scale is now under construction.

The concrete pile dikes, as previously constructed at St. Joseph, Mo., and Fort Riley, Kans., have given sufficient experience to adopt a fairly permanent standard, and 4,500 linear feet of 3-row concrete dike will accordingly be undertaken during the coming season.

Investigation is now under way to devise a lumber mattress in case there should be a shortage of willows in several years.

July 1, 1911, balance unexpended		$894,123.66
Amount received from Isthmian Canal Commission		147.32
Amount received from sale of maps		15.90
Amount received from Quartermaster's Department		2,082.01
		896,368.89
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$429,339.51	
For maintenance of improvement	81,215.71	
		510,555.22
July 1, 1912, balance unexpended		385,813.67
July 1, 1912, outstanding liabilities		248,566.24

July 1, 1912, balance available	$137,247.43
Amount appropriated by sundry civil act approved August 24, 1912	600,000.00
Amount appropriated by river and harbor act approved July 25, 1912	800,000.00
Amount available for fiscal year ending June 30, 1913	1,537,247.43
July 1, 1912, amount covered by uncompleted contracts	804,503.50
Amount of continuing contract authorization, act of Feb. 27, 1911	600,000.00
Amount appropriated under such authorization	600,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 17,600,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 2,100,000.00

FUNDS CONTRIBUTED BY CHICAGO & ALTON RY. CO.

[At Glasgow, Mo.]

Amount contributed	$4,500.00
Amount expended during fiscal year, for maintenance of improvement	4,167.23
Balance unexpended	332.77
Amount refunded to railway company by check	332.77

(c) *Kansas City to Fort Benton* (*1,893*).—The original condition of this reach is described under (*a*). The extreme upper portion from Fort Benton to Carroll, 172 miles, is known as the Rocky River, and on this stretch there are well-defined pools and shoals. From this point down the river gradually assumes, and at Sioux City reaches, its full alluvial character. In the middle and lower reaches of this section it is of varying depths and widths, quite similar to the portion from Kansas City to the mouth, and is obstructed by snags. Where regulation has been carried on and the width reduced, good navigable depths are found, but the maximum low through depth to Sioux City is about 3½ feet, and from there to mouth of Milk River about 3 feet, and from thence to Fort Benton falling as low as 2 feet, when the minimum stage is reached.

The present condition is in general similar to the original, except that snags are fewer and the depths better and over longer portions, due to river improvement.

The improvements heretofore carried on in this section of the river have consisted in dike and revertment work and snagging. The most systematic work has been carried on near St. Joseph, Mo., and just above Kansas City.

This section of the river has been navigated by steamboats to Council Bluffs since 1819; to mouth of Yellowstone, 1832; to Fort Benton, 1859.

Length of entire river, Three Forks to mouth, 2,551 miles. General course, southeast. Length of section, Kansas City to Fort Benton, 1,893 miles. Distance of lower end at Kansas City above mouth, 392 miles.

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[1] Exclusive of amount available for fiscal year 1913.

ORIGINAL PROJECTS.

The numerous partial projects and improvements carried out on this section are given partly under (*a*.) From 1884 to 1890 the work was under the Missouri River Commission.

On the upper portion of the river the work originally consisted mainly in improving the shoals and rapids on the so-called "Rocky River" from Fort Benton downstream for 150 miles. In recent years it has largely been limited to channel regulation and bank protection at the following points: Fort Benton and Judith, Mont.; Williston, Expansion, Deapolis, and Bismarck, N. Dak.; Pierre, Yankton, and Elk Point, S. Dak.; and Sioux City, Iowa. Two ice harbors have been established, one at Rockhaven, N. Dak., the other in the mouth of the Big Sioux River, just above Sioux City.

Works of channel regulation have also been built in the Long Pool, or the reach of the river from the crest of the Great Falls to Cascade, and a small amount of open-river work in the steeper stretch from Cascade to Stubbs Ferry.

The total appropriations to date amount to $5,325,504.65, of which $2,547,046.52 approximately pertain for Kansas City to Sioux City, and $2,778,458.73 Sioux City to Fort Benton.

EXISTING PROJECTS.

There is no approved project for the portion, Kansas City to Sioux City. The river and harbor act of July 25, 1912, appropriates $75,000 for improvement and maintenance for Kansas City to Sioux City, and for Sioux City to Fort Benton, $150,000 for improvement and maintenance in accordance with report submitted in House Document No. 91, Sixty-second Congress, first session.

SIOUX CITY TO FORT BENTON.

Date of adoption by Congress, river and harbor act of July 25, 1912. Estimate of cost, indefinite. Time of completion, indefinite. Work proposed: Regulation and control of river, including snagging and rock removal and maintenance and augmentation of urgent work near important cities and landings.

References to examination or survey reports.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Sioux City to mouth (report)					1881	1069
Sioux City to Fort Benton and Stubbs Ferry (list of reports including local points).	House	421	Fifty-seventh	Second		
Kansas City to mouth and Kansas City to Sioux City.	do	1120	Sixtieth	do		
Between Omaha, Nebr., and mouth of Platte River.	do	46	Sixty-second	First		
Sioux City to Fort Benton	do	91	do	do		
At or near Lake Contrary, Mo	do	750	Sixty-first	Second		
At Lake Contrary, Mo	do	5	Sixty-second	do		
At Atchison, Kans	do	700	Sixty-first	do		

A report on Missouri River at Omaha, South Omaha, Florence, and Dundee, as required by river and harbor act of June 25, 1910, has been made by local officer and will be submitted in due course.

SNAGGING.

Kansas City to Sioux City.—Snagboat *McPherson:* Miles of territory, 415; miles traveled, 2,284; snags removed, 571; trees felled, 624; miscellaneous obstructions removed, 14. Cost, including maintenance and repair of boats, $11,722.

Sioux City to Fort Benton.—Snagboats *McPherson and Mandan:* Miles of territory, 1,304; miles traveled, 4,626; snags removed, 940; trees felled, 1,304; miscellaneous obstructions removed, 143. Cost, including maintenance and repair, $19,862.

Dikes and revetment.

[Day labor.]

NEW WORK.

Locality.	Mile above Kansas City.	Character of work.	Amount during fiscal year.
			Feet.
Fort Benton, Mont	2285	Paving	200
Williston, N. Dak	1720	Revetment	580
Pierre, S. Dak	1174	do	500
Do	1174	Three 3-row dikes	270
Sioux Point, S. Dak	811	Revetment	7,100
Do	811	Dike	100
Opposite Sioux City, Iowa	810	Revetment (4,500 feet)	Begun.

MAINTENANCE.

Locality.	Mile above Kansas City.	Character of work.	Amount during fiscal year.
			Feet.
Missouri River (Rocky River)	1623-1351	Rock removal, repairs, etc	
Williston, N. Dak	1720	Repairs to revetment	270
Elkpoint, S. Dak	837	Dike and temporary work	
Decatur, Nebr	745	Repair to dikes	
Council Bluffs, Iowa	662	do	
Bonton Bend, Mo	488	do	
St. Joseph, Mo	478	Revetment	1,000
Do	478.9	Repair to dike	1,400
Do	479	do	

EMERGENCY WORK.

Locality.	Mile above mouth.	Character of work.	Amount during fiscal year.
			Feet.
Elkpoint, S. Dak	837	Repairs to dike and revetment	(1)
Opposite Sioux City, Iowa	810	Temporary revetment	(1)
Bonton Bend	488	Repairs to dikes	(1)
At St. Joseph, Mo	478.9	Do	400

[1] Work begun.

SPECIAL APPROPRIATION.

Nebraska shore opposite Sioux City, Iowa.—By act of May 9, 1912, $50,000 was appropriated for protection of the Nebraska shore, opposite Sioux City, Iowa, from inroads of Missouri River. Material purchased and the work will be done during the coming season.

PLANT.

One steel hull towboat, 24 feet by 116 feet by 5 feet, *Lieut. Lewis*, delivered and accepted September 3, 1911. Price, $34,735.

There is now under construction at the Sioux Ice Harbor, the following plant:

	Per cent complete.
1 quarter boat, hull 20 by 100 feet, capacity 50 men	80
1 pile driver	30
3 new barges, 100 feet by 20 feet by 5 feet 4 inches	18

REPAIRS TO PLANT AND BOAT YARD.

Steamer *Arethusa*, pile driver *No. V*, and kitchen boat *No. 99*, have had hulls recalked and other minor repairs made.

The total amounts expended to date are as follows:

Act of June 25, 1910:	
Above Le Beau	$96,302.21
Below Le Beau	155,779.06
Kansas City to Sioux City	90,372.89
Sioux City to Fort Benton	168,708.38
May 9, 1912, special act protecting banks of Missouri River in Dakota County, Nebr., opposite Sioux City, Iowa	1,215.17
Emergency allotments:	
St. Joseph, Mo	1,261.02
Opposite Sioux City	1,500.00
Elkpoint, S. Dak	558.16

GENERAL CONSIDERATIONS.

Kansas City to Fort Benton.—Since the work or project is indefinite, no proportion of completed amounts can be given for this section of river as a whole.

Regarding improvement to navigation, there has been a benefit at and along the shores protected, but the maximum through depth remains the same.

Elevations above sea level.

[Feet.]

	Kansas City.	Sioux City.	Fort Benton.
Standard low water	722.44	1,082.74	2,203.59
Standard high water	736.96	1,093.16	2,210.59
Standard variation	14.52	10.42	7.00

Head of navigation, Fort Benton; by steamboats, 2,285 miles above mouth of Missouri River and 1,893 miles above Kansas City.

Amount of freight carried on the Missouri River from mouth to Sioux City, Iowa.

Calendar year—	Short tons.	Calendar year—	Short tons.
1897	391,029	1905	343,435
1898	319,793	1906	573,348
1899	263,114	1907	843,863
1900	277,306	1908	541,144
1901	569,666	1909	340,810
1902	410,527	1910	876,130
1903	750,291	1911	[1] 359,721
1904	455,000		

Amount of freight carried on the Missouri River above Sioux City, Iowa.

Calendar year—	Short tons.	Calendar year—	Short tons.
1887	13,961	1900	27,179
1888	12,895	1901	37,340
1889	16,723	1902	31,070
1890	14,072	1903	37,994
1891	14,211	1904	28,951
1892	17,292	1905	52,956
1893	19,481	1906	43,987
1894	37.936	1907	45,123
1895	21,264	1908	17,517
1896	10,368	1909	41,203
1897	17,105	1910	25,037
1898	26,896	1911	11,290
1899	23,041		

The bulk of this commerce occurs in the vicinity of Bismark, Washburn, and Williston, N. Dak., extending upstream to mouth of Yellowstone, and downstream to Le Beau. The Benton Packet Co. handled about 4,460 tons of grain and other merchandise, with 8 boats, all except one being gasoline. These boats are light draft, stern wheel, gasoline, single cylinder, and carry cargo both aboard and by barge. There are elevators at Washburn, Deapolis, and Expansion, and at Williston. Otherwise landings are made directly on the banks.

NORTH OF LE BEAU.

[See statement, Kansas City to Fort Benton.]

July 1, 1911, balance unexpended	$110,927.07
Amount received from sale of skiff	24.00
Amount received from sale of condemned barges	60.00
Amount received for delay to survey party	8.00
	111,019.07
Amount transferred to work south of Le Beau	10,000.00
	101,019.07
June 30, 1912, amount expended during fiscal year, for work of improvement	57,229.28
July 1, 1912, balance unexpended	43,789.79
July 1, 1912, outstanding liabilities	10,179.05
July 1, 1912, balance available	33,610.74
Amount appropriated by river and harbor act approved July 25, 1912	150,000.00
Amount available for fiscal year ending June 30, 1913	183,610.74

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[1] 307,807 short tons mouth to Kansas City; 51,914 short tons Kansas City to Sioux City.

Amount (estimated) required to be appropriated for completion of existing project	[1] Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance from Sioux City to Fort Benton	[1] $150,000.00

SOUTH OF LE BEAU.

[See statement, Kansas City to Fort Benton.]

July 1, 1911, balance unexpended	$91,717.87
Amount received for delay to snag boats	1,962.57
	93,680.44
Amount transferred to "North of Le Beau"	10,000.00
	103,680.44
June 30, 1912, amount expended during fiscal year, for works of improvement	97,496.93
July 1, 1912, balance unexpended	6,183.51
July 1, 1912, outstanding liabilities	5,704.87
July 1, 1912, balance available	478.64
Amount appropriated by river and harbor act approved July 25, 1912	75,000.00
Amount available for fiscal year ending June 30, 1913	75,478.64
Amount (estimated) required to be appropriated for completion of existing project	[1] Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance from Kansas City to Sioux City	[1] 150,000.00

KANSAS CITY TO FORT BENTON—CONSOLIDATED.

July 1, 1911, balance unexpended		$202,644.94
Amount received from sale of skiff		24.00
Amount received from sale of barges		60.00
Amount received for delay to snag boat and survey party		1,970.57
		204,699.51
June 30, 1912, amount expended during fiscal year, for works of improvement		154,726.21
July 1, 1912, balance unexpended		49,973.30
July 1, 1912, outstanding liabilities		15,883.92
July 1, 1912, balance available		34,089.38
Amount appropriated by river and harbor act approved July 25, 1912		225,000.00
Amount available for fiscal year ending June 30, 1913		259,089.38
Amount (estimated) required to be appropriated for completion of existing project		[1] Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance:		
Kansas City to Sioux City	$150,000.00	
Sioux City to Fort Benton	150,000.00	
		[1] 300,000.00

EMERGENCIES IN RIVER AND HARBOR WORKS.

Elkpoint, S. Dak.

Amount allotted from act of June 25, 1910	$7,500.00
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	558.16

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[1] Exclusive of amount available for fiscal year 1913.

July 1, 1912, balance unexpended	$6,941.84
July 1, 1912, outstanding liabilities	2,446.71
July 1, 1912, balance available	4,495.13

St. Joseph, Mo.

Amount allotted from act of Mar. 3. 1909	4,000.00
June 30. 1912, amount expended during fiscal year, for maintenance of improvement	1,261.02
July 1, 1912, balance unexpended	2,738.98
July 1, 1912, outstanding liabilities	1,270.77
July 1, 1912, balance available	1,468.21

Opposite Sioux City, Iowa.

Amount allotted from act of June 25, 1910	1,500.00
June 30, 1912, amount expended during year, for maintenance of improvement	1,500.00

PROTECTING BANKS OF MISSOURI RIVER IN DAKOTA COUNTY, NEBR. (OPPOSITE SIOUX CITY, IOWA).

Amount appropriated by special act of May 9, 1912	$50,000.00
June 30, 1912, amount expended during fiscal year, for works of improvement	1,215.17
July 1, 1912, balance unexpended	48.784.83
July 1, 1912, outstanding liabilities	2,588.87
July 1, 1912, balance available	46,195.96

FUNDS CONTRIBUTED BY CITIZENS OF SIOUX CITY, IOWA.

Amount contributed by citizens	$15,342.00
Amount expended during fiscal year, for works of improvement	15,208.20
July 1, 1912, balance unexpended	133.80
July 1, 1912, outstanding liabilities	133.80

FUNDS CONTRIBUTED BY UNION TERMINAL RY. CO. (AT ST. JOSEPH, MO).

Amount contributed	$3,000.00
Amount expended during fiscal year, for maintenance of improvement	3,000.00

(*d*) *At St. Joseph, Mo.*—This locality is on the portion from Kansas City to Fort Benton, about 87 miles above Kansas City by water and 62 miles by rail.

The original and present conditions are given under subheads (*a*) and (*c*). Local commerce is small. For amount of commerce over this portion see (*c*).

The river and harbor act of June 25, 1910, adopted a project as follows:

> Improving Missouri River at Saint Joseph, Missouri, in accordance with the report submitted in House Document Numbered Eight hundred and twenty-four, Sixtieth Congress, first session, seventy-five thousand dollars: *Provided*, That no part of this amount shall be expended until the city of Saint Joseph, or other agency, shall have deposited to the credit of the Secretary of War in some duly recognized United States depository, to be designated by him, the sum of seventy-five thousand dollars, to be expended by said Secretary of War, together with the amount herein appropriated, in the executior of the plan of improvement recommended in the report herein referred to.

The work contemplated is the construction of 16,000 feet of standard revetment on the left bank near Lake Contrary, at an estimated cost of $150,000, with $3,000 annually for maintenance.

The funds for cooperation have not yet been secured, though the local interests have been informed of the status of the appropriation.

No work will be undertaken until the conditions as to contribution of $75,000 are complied with.

July 1, 1911, balance unexpended	$75,000
July 1, 1912, balance unexpended	75,000

(*e*) *At Atchison, Kans.*—This locality is on the portion from Kansas City to Fort Benton, about 56 miles above Kansas City by water and 47 miles by rail.

The original and present condition are given under subheads (*a*) and (*c*).

Local commerce is small. For amount over this portion see subhead (*c*).

The river and harbor act of June 25, 1910, adopted the following project:

> Improving Missouri River at Atchison, Kansas, in accordance with the report submitted in House Document Numbered Seven hundred, Sixty-first Congress, second session, ninety thousand dollars: *Provided*, That no part of this amount shall be expended until the city of Atchison, or other agency, shall have deposited to the credit of the Secretary of War, in some duly recognized United States depository to be designated by him, the sum of ninety thousand dollars to be expended by said Secretary of War, together with the amount herein appropriated, in the execution of the plan of improvement recommended in the report herein referred to.

The work contemplated is the construction of a system of longitudinal and wing dikes on left bank, Missouri, just above the Atchison railroad bridge, at an estimated cost of $180,000, with $4,500 annually for maintenance.

The funds for cooperation have not yet been secured, though the local interests have been informed of the status of the appropriation.

No work will be undertaken until the conditions as to contribution of $90,000 are complied with.

July 1, 1911, balance unexpended	$90,000
July 1, 1912, balance unexpended	90,000

(See Appendix AA 1.)

2. *Osage River, Mo.*—The Osage River rises in the eastern part of Kansas and flows generally in an easterly direction, emptying into the Missouri River about 8 miles below Jefferson City, Mo.; total length about 500 miles. Length of river mouth to Warsaw, Mo., 172 miles. Above Warsaw the river was declared by act of March 4, 1904, to be not navigable. The river has been navigated to Osceola, 228 miles above the mouth, and has been used for rafts and logs at even greater distances. The river is now under improvement to the town of Linn Creek (Niangua River), 109 miles above the mouth. The elevation of standard low water at mouth, foot of Dodds Island, is 102.78, and of standard high water 116.36 above St. Louis directrix, a range of 13.58 feet. The average slope of the river from Osceola to the mouth is 0.74 foot per mile, and from Niangua River to the mouth about 0.60 foot per mile. The range between extreme low and high water averages 30 feet.

The original condition was one of alternate pools and shoals, with snags and overhanging trees.

The work has been carried on under two projects—that of open-channel improvement, by the construction of cross and wing dams, in addition to dredging and removal of obstructions to navigation, such as snags, etc., and the construction of a lock and dam 7 miles above the mouth of the river.

The first project or plan was general in its nature. The first appropriation was made in 1871, and no estimate of cost or time limit was adopted.

The removal of obstructions under this plan contemplates maintenance. The obstructions will form anew, and while the cross and wing dams have a degree of permanency, they must receive frequent repair and extension to keep up their efficiency.

The lock and dam was authorized by act of 1890, no time limit or total cost given. This work has been practically completed. The crest of the dam is about 13 feet above low water and creates a pool for about 18 miles.

The river and harbor act of June 25, 1910, appropriated $35,000, of which $10,000 was allotted for continuing improvement and for maintenance and $25,000 for completion of lock and dam.

The act of February 27, 1911, appropriated $15,000 for general river improvement and for maintenance, and the act of July 25, 1912, appropriated $15,000 for the same purpose.

The total of the appropriations and receipts from other sources for improvement of the Osage River, beginning with the act of March 3, 1871, is $1,021,030.03.

The amount expended by the General Government to June 30, 1912, on both projects is $979,040.49, of which $355,046.61 is for general improvement, and $623,892.48 is for lock and dam.

The result of the expenditure has been to increase the depth over the shoals, remove obstructions, and keep open navigation. The least depth at low water over shoals is 1½ to 2 feet, while in the pools the depth ranges from 5 to 15 feet.

The work of general improvement follows the general plan adopted in 1871, and based upon which the first appropriation was made.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to Osceola					1875	[1] 20
Osage River notes					1898	3539
Osage River history, 1871 to 1900					1900	4944
Mouth to Niangua River	House	960	Sixtieth	First		

[1] Appendix L.

The work during the year on open-river improvement has consisted in snagging, dredging, and repair and extension of longitudinal and wing stone dikes on the reach from the lock and dam to Linn Creek at mouth of Niangua River. The following work was accomplished:

Dams constructed	linear feet	304
Dams and training walls repaired	do	740
Stone quarried	cubic yards	1,301
Gravel dredged from channel	do	5,103
Snags and obstructions removed from channel	number	80
Miles of river worked over	do	70

Plant.—The following repairs to plant and new plant has been authorized and is now under construction:

The reconstruction of the steamer *Osage* was completed; dimensions, 80 feet 2 inches by 15 feet 1 inch by 3 feet 10½ inches. New hull for dredge, 92 by 30 by 4 feet, was completed and machinery overhauled. Material barge was rebuilt. Maneuvering barge for dam was constructed from old plant.

The improvement has influenced freight rates by affording shippers a regular means of transportation by boat and increasing the draft. Practically no rail facilities.

It is proposed to use the amount required for expenditure in fiscal year ending June 30, 1914, in addition to the balance unexpended July 1, 1912, for works of improvement, and for maintenance of general improvement, including snagging, dredging, and repairs to dikes and open-river work.

In view of the funds in hand and survey report submitted to Congress in compliance with a provision of the river and harbor act of March 2, 1907, and not yet acted upon by Congress, the estimate submitted is for operating plant and maintenance.

Lock and dam.—At the beginning of the fiscal year the dam was practically completed. As now constructed there are 375 feet of Chittenden weirs (5 weirs, each 75 feet, Nos. 1, 7, 8, 9, and 10) and 415 of chanoine wickets, between weirs 1 and 6. The foundation is about 9 feet above the river bed and the movable portion has a lift of 7 feet. The drum weirs have been found heavily filled with sediment and require considerable labor to remove same. They have been made to operate several times, but always with great difficulty and after clearing the drums of sediment.

The old wooden gates at the lock were replaced with steel gates at a cost of $13,695.88. The lock chamber is 42 by 220 feet.

During the heavy rise of 1912 some of the rock fill in front of apron-crib protection was scoured away. Preparation is now made to replace this with heavier construction. Work on the lock grounds has been completed as follows:

Lock keeper's house repaired and enlarged.
Assistant lock keeper's house constructed.
Water and sewerage installed.
Quarters for laborers completed.
Warehouse completed.
Shed and shop completed.
Lock grounds raised to a height of highest floods. About 5,500 cubic yards fill placed.
The power house has been completed.

A survey of the mouth of the Osage River was made.

The funds on hand and available will be applied to the completion of grounds, replacing rock fill, operation and improvement of the Chittenden drums, and to maintenance.

Beginning July 1, 1912, the operation of lock and dam will be carried under funds from appropriation for "Operating and care of canals and other works of navigation, indefinite, Osage River, Mo."

Amount of freight carried on the Osage River.

Calendar year—	Short tons.	Calendar year—	Short tons.
1895	76,706	1904	35,746
1896	72,393	1905	8,678
1897	71,247	1906	20,506
1898	84,286	1907	31,601
1899	76,702	1908	30,606
1900	96,144	1909	25,264
1901	72,339	1910	23,662
1902	95,194	1911	19,274
1903	38,501		

July 1, 1911, balance unexpended		$77,096.75
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$11,183.07	
For maintenance of improvement	23,924.14	
		35,107.21
July 1, 1912, balance unexpended		41,989.54
July 1, 1912, outstanding liabilities		1,993.32
July 1, 1912, balance available		39,996.22
Amount appropriated by river and harbor act approved July 25, 1912		15,000.00
Amount available for fiscal year ending June 30, 1913		54,996.22
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 15,000.00

(See Appendix AA 2.)

3. Gasconade River, Mo.—This river rises in the southern part of Missouri and flows generally northeast, emptying into the Missouri River at Gasconade, about 32 miles below the mouth of the Osage River. Total length with tributaries, about 200 miles; area of watershed, 3,478 square miles; low-water discharge, 450 second-feet; extreme flood discharge, 40,000 second-feet.

Length of river, mouth to Arlington, 107 miles. Improvement in recent years has extended to Gascondy, 62 miles above the mouth. The river is navigable to Arlington, and for tie and log rafting a considerable distance above.

The elevation of standard low water at the mouth is 80.11 feet, and of standard high water is 93.64 feet above St. Louis directrix, a range of 13.54 feet. The average slope of the river from Gascondy to the mouth is 1.23 feet per mile. Low water at Gascondy is approximately 156 feet above St. Louis directrix. The range between extreme low and high water averages about 20 feet.

This river is similar to the Osage. The original condition was one of alternate pools and shoals, with snags and overhanging trees.

The project for the improvement of this stream, adopted in 1880, consisted in the removal of snags and logs from the channel and of leaning timber from the banks of the river, where necessary, and the construction of wing dams and training walls to concentrate the flow of water upon the shoals to increase the depth over them.

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[1] Exclusive of amount available for fiscal year 1913.

The project or plan is general in its nature. The first appropriations was made in 1880, and no estimate of cost or time limit was given. The project contemplates maintenance and relief from year to year and the removal of obstructions, which are constantly forming anew. The improvement must therefore be considered continuous.

The river and harbor act of June 25, 1910, appropriated $20,000 for continuing improvement and for maintenance. It also provides for an examination and survey, Gascondy to Arlington. Report will shortly be submitted.

The river and harbor act of February 27, 1911, appropriated $10,000 for continuing improvement and for maintenance, and the river and harbor act of July 25, 1912, appropriated the sum of $10,000 for the same purpose.

An allotment of $5,500 from the emergency appropriation of June 25, 1910, was made for the repair of the dam at head of Pryors Bend.

The total of the appropriations and receipts from other sources for the improvement of Gasconade River, beginning with the act of June 14, 1880, is $162,124.31.

The amount expended to June 30, 1912, is $156,698.66.

The result of the expenditure has been to increase the depth over shoals, remove obstructions, and maintain navigation. The least depth at low water over shoals is 1½ to 2 feet, while in the pools the depths range from 4 to 15 feet.

The improvement has influenced freight rates by affording shippers a regular means of transportation by boat and in increasing the draft. There are practically no available rail facilities.

The work of improvement and maintenance is being carried out under the general plan followed since 1880, and based upon which the appropriation was made.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
General report					1878	479
Do					1880	1462
Do					1896	3800
Do					1898	[illegible]
Mouth to Gascondy	House	829	Sixtieth	First		

A report on the Gasconade River, Gascondy to Arlington, as required by the act of June 25, 1910, has been made by the local officer and will be submitted in due course.

During the past season the boating channel was cleared of snags and wrack heaps, and all overhanging trees were trimmed or felled. Also dikes were repaired and extended. A gap of 150 feet in the left bank (island), at head of Pryors Bend, occurred during the spring flood of 1912, which will be replaced with a rock dam this season. The total length of this dam of timber piles and rock will be about 550 feet. It closes off a chute 3,000 feet long and causes the river to flow around Pryors Bend 12,000 feet. The fall over this portion is 7 feet. In general improvement the following was accomplished:

Snags and obstructions removed		430
Dredging	cubic yards	1,900
Repairs to dams	linear feet	150
Extension to new dams	do	667
New dams	do	1,034
Rock used, including 1,771 cubic yards Pryors Dam	cubic yards	4,391

Minor repairs have been made to plant during the year.

Gasoline towboat *Gasconade*, constructed during the previous year, was in operation. She is stern wheel, wooden hull, 40 horsepower, 48 feet 10 inches by 12 feet by 2 feet 6 inches; draft, 15 inches; length over all, 60 feet 5 inches; cost, about $2,700.

The improvement has influenced freight rates by affording shippers a regular means of transportation by boat and increasing the draft. There are practically no available rail facilities.

It is proposed to use the amount required for expenditure in fiscal year ending June 30, 1914, in addition to the balance unexpended July 1, 1912, for works of improvement in continuing present project, which is indefinite, including plant to carry on work and for maintenance of existing works.

In view of the funds in hand and survey report submitted to Congress in compliance with provisions of the river and harbor act of March 2, 1907, and not yet acted upon by Congress, the estimate submitted is for operating plant and maintenance.

Amount of freight carried on the Gasconade River.

Calendar year—	Short tons.	Calendar year—	Short tons.
1895	47,544	1904	14,791
1896	46,294	1905	29,837
1897	30,515	1906	27,604
1898	30.981	1907	50,083
1899	24,259	1908	28,887
1900	51,580	1909	29,931
1901	19,460	1910	30,758
1902	44,380	1911	41,535
1903	10,788		

July 1, 1911, balance unexpended		$11,604.42
Amount allotted from emergency appropriation made by river and harbor act approved June 25, 1910		5,500.00
		17,104.42
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$11,255.34	
For maintenance of improvement	423.43	
		11,678.77
July 1, 1912, balance unexpended		5,425.65
July 1, 1912, outstanding liabilities		1,626.30
July 1, 1912, balance available		3,799.35
Amount appropriated by river and harbor act approved June 25, 1912		10,000.00
Amount available for fiscal year ending June 30, 1913		13,799.35
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 10,000.00

(See Appendix A A 3.)

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[1] Exclusive of amount available for fiscal year 1913.

4. *Fort Riley Military Reservation, Kans.—(a) Preservation of bank line of Republican River, Fort Riley, Kans.*—The sundry civil act of March 4, 1909, appropriated $25,000 for bank preservation at For Riley, Kans., as follows:

> **Fort Riley Military Reservation, Kansas: For the preservation of the bank line of the Republican River in front of the Fort Riley Military Reservation, by revetment and such other work as may be necessary to protect the said reservation from damage by erosion, twenty-five thousand dollars, to be immediately available.**

A project was submitted and approved for two 2-row concrete-pile dikes, 800 and 400 feet, respectively. The piles were 30 feet by 11 inches, reenforced with ¾-inch steel rods. The bracing was reenforced concrete, 6 inches by 8 inches in section. This is the first complete permeable dike of concrete constructed on American rivers having both piles and bracing of reenforced concrete. A short 3-row pile dike with partial concrete bracing was built near St. Joseph, Mo., on the Missouri River, in 1908.

The 800-foot dike was extended 300 feet during 1910 and 1911, and minor repairs made. A flexible reenforced concrete block revetment of 800 square feet was placed at lower end of extension, the blocks being 18 inches square and 4 inches thick, and held together by ¼-inch rings and bolts. During the past year a standard revetment 300 feet long was placed above upper end of 1,100-foot dike, and a standard revetment 100 feet long below lower end. The willow mattress in both cases was 45 feet wide. These were to prevent erosion of the banks above and below the finished dike. The cost was about $6.40 per linear foot. Some small washes in the curtain of dike were refilled with brush and rock.

Reports of previous work are given on page 1,842, Annual Report, Chief of Engineers, 1911. The average cost of the 1,500 feet of 2-row concrete dike was $13.03 per linear foot.

The entire work is now in good condition, and the results of the next high water on concrete dike and block will be carefully noted.

The funds on hand will be used to maintain the dike system and protect the eroding bank above, if necessary.

July 1, 1911, balance unexpended	$5,451.32
June 30, 1912, amount expended during fiscal year, for works of improvement and for maintenance	2,713.92
July 1, 1912, balance unexpended	2,737.40

(*b*) *Preservation of bank line, Smoky Hill and Republican Rivers, Fort Riley, Kans.*—Authorized estimate, $8,500.

This work was authorized by the Secretary of War, August 30, 1911. Payment for the work was made from current funds from appropriation for "Improving Missouri River (Kansas City to the mouth)" and reimbursed by Treasury settlements from appropriation for "Roads, walks, wharves, and drainage, fiscal year 1912." The project as carried out consisted of the following:

Republican River: At point A, 180 feet drain pipe and two rock and brush dams	$594.54
Smoky Hill and Republican Rivers: At point B, four rock and brush dams and five aprons placed	778.56

Smoky Hill River: At point B, 500 feet of standard revetment with 45-foot willow mattress	$4.375.95
Total cost	5,749.03
June 30, 1912, amount expended	5,593.79
June 30, 1912, amount of freight settlements against appropriation	155.24
June 30, 1912, total cost of completed work	5,749.03

(See Appendix A A 4.)

5. *Improving Kansas River at Kansas City, Kans.*—The Kansas River rises in eastern Colorado and flows generally east, emptying into the Missouri River at Kansas City. The extreme length of watershed is about 500 miles and area of watershed 5,799.8 square miles. The river proper is formed at Junction City (Fort Riley), 176 miles above the mouth, by the junction of the Smoky Hill and Republican Rivers. Average slope of this portion 1.85 feet per mile.

The length of the river from the mouth to Argentine is approximately 6 miles. Elevation of low water at mouth is 309 feet above St. Louis directrix. Elevation of extreme flood height at mouth is 339 feet above St. Louis directrix. Average slope, mouth to Argentine, 1.50 feet per mile. Discharge low water, 2,000 second-feet; discharge high water, 150,000 second-feet; extreme flood of 1903, 300,000 to 350,000 second-feet. Ordinary range at mouth between high and low water, 16 feet; extreme range, 30 feet.

The river has been navigated to Fort Riley and Junction City. The present river traffic is confined to the lower 10 miles of river, extending through Kansas City, Kans., and Argentine, up to Turner.

The original condition of the river was one of varying depth, with sand bars, shoals, and snags. The width was from 800 to 1,000 feet. Depth at low water about 2 feet.

The present condition of the bed of the lower 10 miles of river is one of débris, wreckage, and general encroachment. Several of the bridges are now being reconstructed. Levee work and revetment along the approved harbor lines has been about 75 per cent completed.

During the past year supervision has been carried on by this office of levee and revetment construction, bridge reconstruction, etc., funds being available from the act of June 25, 1910, for examinations, surveys, and contingencies of rivers and harbors.

The act of July 25, 1912, provides as follows:

> Improving Kansas River, Kansas: For improvement of Kansas River up to Argentine, Kansas, in accordance with report submitted in House Document Numbered Ninety-four, Sixty-second Congress, first session, four thousand dollars.

The project as outlined in this document consists in supervision as to harbor-line encroachments, bridge reconstruction, and removal of débris and obstructions from the bed of river.

No previous appropriation has been made for the river.

The influence of improvements will be to give a better and more unobstructed channel. The waterway will be used mainly for local freight between the river and navigation wharf on the Missouri River front at Kansas City, Mo. An extensive sand commerce is now existing on the river, amounting to over half a million yards annually.

The river and harbor act of July 25, 1912, also provides for a survey and report of the "Kansas River from the mouth to the western limits of Kansas City, Kans., with a view of removing all obstructions therefrom, dredging and widening the mouth, and extending the improvement so as to fit the same for navigation, and to consider propositions for cooperation on the part of local authorities and interests."

Floods.—This river suffered a severe flood in 1903, causing a damage of $20,000,000 at Kansas City alone. Sixteen bridges across the river were destroyed, leaving one standing. Another disastrous flood, though of less proportions, followed in 1904, and another in 1908.

A special report on flood conditions, encroachments, bridges, etc., was made in 1904 by a board of engineer officers. Shortly after this a drainage district was organized under the laws of Kansas for river regulation and flood control. In 1909 Congress authorized the establishment of harbor lines for the river, varying in distance apart from 734 feet at the mouth to 900 feet at the Argentine wagon bridge, 27,000 feet above the mouth. The drainage district has voted bonds to the extent of $1,750,000 for construction of levees, revetments, widening of river, rights of way, condemnation, etc. This work is well on to completion except removal of débris and general excavation. Four bridges are now in process of reconstruction.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
General river					1898	2288
Do	House	82	Fifty-eighth	Second		
Argentine to mouth	Senate	160	do	do		
Do	House	94	Sixty-second	First		

Amount appropriated by river and harbor act approved July 25, 1912 .. $4,000.00
Amount available for fiscal year ending June 30, 1913 .. 4,000.00

(See Appendix AA 5.)

EXAMINATION AND SURVEY MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports dated October 26, 1910, and February 10, 1911, with map, on preliminary examination and survey, respectively, of *Missouri River near Omaha, South Omaha, Florence, and Dundee, with a view to improvement for navigation and protection of the banks in cooperation with local interests*, required by the river and harbor act approved June 25, 1910, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 862, Sixty-second Congress, second session.

The improvement of this locality by the United States in the manner proposed is not deemed advisable at the present time.

The local officer was also charged with the duty of making a preliminary examination and survey required by the river and harbor act approved June 25, 1910, of *Gasconade River, Mo., from Gascondy to Arlington*, and reports thereon will be duly submitted when received.

IMPROVEMENT OF RIVERS AND HARBORS IN THE NASHVILLE, TENN., DISTRICT.

This district was in the charge of Maj. William W. Harts, Corps of Engineers, until July 24, 1911; in the temporary charge of Maj. C. A. F. Flagler, Corps of Engineers, from July 24, 1911, to October 21, 1911; in the charge of Maj. Edgar Jadwin, Corps of Engineers, from October 21, 1911, to December 11, 1911; in the charge of Maj. H. Burgess, Corps of Engineers, since the latter date. Division engineer, Lieut. Col. H. C. Newcomer, Corps of Engineers.

1. Obion and Forked Deer Rivers, Tenn.—The river and harbor act of June 13, 1902, authorized the joint improvement of the Obion and Forked Deer Rivers.

(*a*) *Obion River.*—This stream is situated in northwestern Tennessee. It is formed by the junction of its North and South Forks about 6 miles northeast of Obion, which is considered the head of navigation for steamers and other craft, and it flows in a general southwesterly direction about 75 miles, entering the Mississippi River some 5 miles below the Missouri and Arkansas State line. It is probable that rafting and logging are feasible as far up as 25 miles above Obion. The improved section is about 69 miles long.

In its original condition the obstructions on this river were almost wholly drift, snags, and overhanging trees, which made navigation difficult and uncertain.

The original project was based on a survey made in 1891, and was adopted by the river and harbor act of July 13, 1892. The scope of the work was to obtain 3-foot navigation at low water by means of open-channel work, at an estimated cost of $50,000. After an expenditure of $15,795.01 this project was modified in June, 1897, to one for maintenance, so as to keep the river free from such obstructions as would prevent navigation at medium and high stages, at an estimated annual cost of $2,500.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entire stream					1881	1496
From mouth to crossing of L. & M. R. R. in Obion County.					1891	2292
Preliminary examination of Obion and Forked Deer Rivers.[1]	House	206	Fifty-eighth	Second	1904	2351

[1] Project document. No maps published with above reports.

The present project contemplates only maintenance of the channel in a navigable condition by the removal of surface obstructions from time to time as necessary.

In 1903 the annual expenditure recommended for maintenance of the Obion and Forked Deer Rivers combined was reduced from $4.500 to $2,250. (See Annual Report for 1904, p. 2351.)

No work was done during the past fiscal year. The sum of $50.19 was expended for maintenance of plant.

Appropriations and allotments aggregating $29,618.50 have been made for the Obion River, of which $28,716.49 has been expended under the present project to June 30, 1912.

The expenditures have resulted in temporary improvements to the channel, lessening the dangers to navigation at medium and higher stages from Obion, Tenn., to the mouth of the river. The navigability of the Obion River depends largely on the stage of water in the Mississippi. Navigation is not practicable at low stages. The plane of reference is ordinary low water.

Efforts were made to obtain commercial statistics, but without result. Reports heretofore have shown that the bulk of the commerce consists of timber products.

Unless Congress indicates its desire to continue this work by making further appropriation, no further annual reports will be submitted.

July 1, 1911, balance unexpended	$952.20
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	50.19
July 1, 1912, balance unexpended	902.01
July 1, 1912, outstanding liabilities	3.00
July 1, 1912, balance available	899.01

(*b*) *Forked Deer River.*—This stream is formed by the junction of its North and South Forks about 8 miles southwest of Dyersburg, and flows thence in a general southwesterly direction about 21 miles, entering the Obion River about 3½ miles from the Mississippi. Dyersburg is considered the head of navigation on the North Fork. Jackson, Tenn., 95½ miles above the mouth, was formerly considered the head of navigation on the South Fork, but in recent years navigation appears to have been limited to the lower portion of this stream. It is probable that rafting and logging can be carried on to a distance of 25 miles above Dyersburg. The improved section is about 21 miles long.

In their original condition the main stream and its branches, the North Fork and South Fork, were greatly obstructed by snags and drift. The original project may be said to have been adopted by the river and harbor act of August 2, 1882, and was based on a report of an examination of South Fork, dated December 16, 1880. This project was subsequently modified by extension to include the North Fork and main stream until appropriations aggregating $25,000 were made and expended. The operations proposed were open-channel work, by which it was sought to maintain a satisfactory channel all the year around. This project was set aside in view of the fact that the result aimed at could not be accomplished by this method.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Examination of the North Fork and Forked Deer River from Dyersburg to mouth of the main stream.					1874	372
Examination of South Fork, from Jackson to the junction with North Fork; of the North Fork, from Collins to the mouth of Forked Deer River, main stream.					1881	1489
Preliminary examination of the North Fork below Dyersburg, Tenn.					1887	1494
Examination of Forked Deer from Dyersburg, Tenn., to its junction with the Obion River and thence to the Mississippi River.	House	156	Fifty-third	Third	1895	2265
Survey of the North Fork of Forked Deer River, Tenn., from Dyersburg to the main stream, thence to the Obion River.	do	282	Fifty-fourth	Second	1897	2234
Preliminary examination of Obion and Forked Deer Rivers.[1]	do	206	Fifty-eighth	do	1904	2351
Survey of the South Fork of the Forked Deer River, Tenn.	do	945	Sixtieth	First		

[1] Project document. No maps printed with above reports.

The present project, based on the provisions of the act of March 3, 1899, provides only for maintenance of the channel in a navigable condition by the removal of surface obstructions from time to time as may be found necessary.

In 1903 the annual expenditure recommended for maintenance of both the Obion and Forked Deer Rivers was reduced from $4,500 to $2,250. (See Annual Report for 1904, p. 2351.)

No work was done during the past fiscal year. The funds expended, $62.95, were applied to the maintenance of plant.

Under the present project appropriations and allotments aggregating $12,818.50 have been made, of which $12,100 has been expended to June 30, 1912.

The expenditures have resulted in temporary improvements to the channel, lessening the dangers to navigation at medium and higher stages. The navigability of the Forked Deer River depends largely upon the stage of water in the Mississippi. Navigation is not practicable at low stages. The plane of reference is ordinary low water.

Efforts were made to obtain commercial statistics, but without result. Reports heretofore have shown that the bulk of the commerce on this stream consists of timber products.

Unless Congress indicates its desire to continue this work by making further appropriation, no further annual reports will be submitted.

July 1, 1911, balance unexpended	$781.45
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	62.95
July 1, 1912, balance unexpended	718.50
July 1, 1912, outstanding liabilities	1.50
July 1, 1912, balance available	717.00

CONSOLIDATED.

July 1, 1911, balance unexpended	$1,733.65
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	113.14
July 1, 1912, balance unexpended	1,620.51
July 1, 1912, outstanding liabilities	4.50
July 1, 1912, balance available	1,616.01

(See Appendix BB 1.)

2. Cumberland River, Tenn. and Ky.—The Cumberland River rises in eastern Kentucky, on the western slope of the Cumberland Mountains, flows in a tortuous course of about 688 miles through eastern Kentucky, middle Tennessee, and western Kentucky, and discharges into the Ohio River near Smithland, Ky. From Burnside, Ky., the head of steamboat navigation, to Smithland, Ky., the distance is 518 miles by the river, 203 miles being in the State of Kentucky and 315 miles in the State of Tennessee.

(*a*) *Below Nashville* (*193 miles*).—In its original condition this section of the river was considerably obstructed by rocky ledges, conglomerate, gravel and sand bars, snags, and other surface obstructions, on account of which navigation was rendered very uncertain. The general direction of flow is northwest.

From 1830 to 1840 the legislatures of Tennessee and Kentucky made several appropriations for the improvement of the navigation of the Cumberland River, but little benefit to the general condition of the river seems to have been accomplished. The Cumberland Navigation Co. was incorporated by the State of Tennessee in 1846 for improving the "navigation of the Cumberland River below the town of Nashville by means of a system of locks and dams," but nothing effective was done to carry out the proposed improvement.

From July 17, 1832, to July 7, 1838, Congress made five appropriations for improving the Cumberland River, Tennessee and Kentucky, aggregating $155,000, $20,000 of which was to be expended below Nashville and $135,000 on the river generally, but all the appropriations for the above period were expended below Nashville, to improve the worst localities.

Between 1838 and 1871 no appropriations for this river were made. The original project (open-channel work), which provided specifically for operations on this section, was adopted by the river and harbor act of March 3, 1871, based on project submitted January 20, 1871. The work proposed was as follows: To excavate the bars and rock ledges in order to get an additional depth of water; to contract the waterways in places in order to get the requisite depth; to remove snags and bowlders from the main channel; and to restrain tributary streams in well-determined channels at their junction with the river.

To increase the depth of water at the shoals in Kentucky Chute at the junction of the Cumberland with the Ohio River, a board of engineer officers in 1888 recommended the construction of a dike near Smithland, Ky., at an estimated cost of $129,600. The river and harbor act of September 19, 1890, allotted $30,000 from the appropriation for improving Cumberland River below Nashville, to be expended in improving the mouth of the river, as recommended.

Appropriations aggregating $805,000 were made and expended, thus completing the above project. The expenditures under the old project have resulted in lengthening the season of navigation by giving an increased depth at low water combined with greater security in the passage of obstructions.

The present project, or project of canalization of the Cumberland River below Nashville, may be considered to have been adopted by the river and harbor act of July 13, 1892. It contemplates the extension of the lock and dam system of the upper river over a considerable portion of the river below Nashville by the construction of seven locks and dams. (Annual Report Chief of Engineers for 1909, p. 586.) Under this project, Lock A, the first of the series, was placed in operation in November, 1904.

A modification of this project was adopted by the river and harbor act of June 25, 1910, based on a survey of the lower Cumberland, the reports of which are printed in House Documents No. 758, Sixtieth Congress, first session, and No. 1481, Sixtieth Congress, second session.

The modified or existing project contemplates the completion of the canalization scheme by the construction of five additional locks, beginning with Lock B, about 51.5 miles below Nashville, and ending with Lock F, about 147 miles below Nashville, thus reducing the total number of locks from seven to six. The proposed locks are to be 52 feet wide and 280 feet long, with lifts varying from 10 to 13.1 feet. It also includes dredging the rest of the river to the mouth (about 46 miles) to a depth of 6 feet at low water, the total estimated cost of the additional improvement being $3,164,882.40.

References to examination and survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Below Nashville, with a view to slack-water navigation.					1890	2158
Resurvey of mouth [1]	House	283	Fifty-fourth	Second	1897	2242
Below Nashville, Tenn. and Ky	do	758	Sixtieth	First		
Do.[2]	do	1481	do	Second		

[1] Project document: No maps.

[2] Contains maps.

During the fiscal year the sites of locks and abutments of Dams B, C, D, E, and F were acquired, with the exception of one strip forming part of the site of Lock E, in regard to which a suit for condemnation is now pending. All the lands were acquired by voluntary conveyance except three parcels, including the one for which suit is pending.

Snagging operations, to which funds for maintenance were applied, were carried on from Nashville for a distance of 151 miles below.

Contracts were let for the construction of Locks B and C; and proposals were advertised for and received for the filling valves, anchorages, etc., for these locks and also for the sluice valves. At the close of the fiscal year contracts had not yet been awarded. The amount expended in these operations and the contingencies pertaining thereto was $17,868.46.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $472,255.42, of which $34,011.03 was applied to maintenance. Under the project of canalization, appropriations, and allotments aggregating $923,000 have been made, which, together with the receipts from other sources amounting to $1,002.80, makes a total of $924,002.80. The construction of Locks B and C is provided for under continuing contract appropriations.

The act of June 25, 1910, appropriated $213,000 cash and authorized contracts to an additional amount of $450,000.

The sundry civil act of March 4, 1911, made a further appropriation of $250,000 under this authorization, leaving $200,000 still to be appropriated.

Approximately one-sixth of the project has been accomplished to June 30, 1912.

These expenditures have resulted in the periodical removal of snags and other surface obstructions from the navigable channel, the protection of the bank of a part of Cumberland Island in Kentucky Chute at the mouth of the river, and the completion and placing in operation of Lock A, November 26, 1904, whereby 6-foot navigation has been afforded all year round for a distance of 38.8 miles above the lock. The season of profitable navigation from the Ohio River to Nashville has been prolonged by 45 to 90 days, depending on the stage of water, making it now average eight months annually. Lock A is 41.4 miles below Nashville.

The Cumberland River below Nashville is usually navigable for all steamboats plying on it for six months in each year; for boats not drawing over 3 feet, from six to eight months, and for boats drawing 16 inches or less, the whole year. General navigation, however, is practically closed for several months each year during low water. As a general rule, when the stage is below 2½ feet, navigation is closed; between 2½ feet and 5 feet it is uncertain and above 5 feet good. A table is given on page 390 of the Annual Report of the Chief of Engineers for 1902, showing the stages at Burnside, Carthage, Nashville, and Clarksville for the years 1898–1902. The plane of reference is ordinary low water.

The head of navigation for this section is Nashville. The navigable portion extends to the mouth, 193 miles.

The reported commerce for the calendar year 1911 was 223,278 short tons, having an estimated value of about $3,549,114. Passengers carried, 4,500. The tonnage consisted principally of timber and farm products and general merchandise.

It is reported that the Tennessee Central Railroad, which parallels the Cumberland River from Nashville to Clarksville, had rates in force before the completion of Lock and Dam A of from 18 to 26 cents per 100 pounds, and since this lock was put in operation these rates have been reduced above the lock to from 6 cents to 12 cents per 100 pounds. There is little doubt that the competition offered by the Cumberland River, even in its present condition, is the cause of the favorable rates into Nashville.

The amount required for expenditure in the fiscal year ending June 30, 1914, will be applied toward the construction of Locks

B and C ($200,000). The amount for these locks is covered by the contract authorization provided by the act of June 25, 1910, and it is expected that the appropriation will be carried by the next sundry civil act. In order that the improvement may be prosecuted most economically and advantageously, it is necessary and so recommended that the next river and harbor act provide a further contract authorization for the work on this project for the entire amount of the estimate for its completion, or at least in the sum of $878,000, which is the balance, in round numbers, of the estimate for the construction of Locks and Dams B, C, and D. The work is necessary for the extension of the improvement. The sum of $5,000 is also estimated for maintenance for the year 1914.

July 1, 1911, balance unexpended		$469,615.84
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$14,982.78	
For maintenance of improvement	2,885.68	
		17,868.46
July 1, 1912, balance unexpended		451,747.38
July 1, 1912, outstanding liabilities		170.19
July 1, 1912, balance available		451,577.19
Amount appropriated by river and harbor act approved July 25, 1912		305,000.00
Amount available for fiscal year ending June 30, 1913		756,577.19
July 1, 1912, amount covered by uncompleted contracts		488,434.40
Amount of continuing contract authorization, act of June 25, 1910		450,000.00
Amount appropriated under such authorization		250,000.00
Amount yet to be appropriated		200,000.00
Amount (estimated) required to be appropriated for completion of existing project		[1] 2,401,882.40
Amount that can be profitably expended in fiscal year ending June 30, 1914:		
For works of improvement		200,000.00
For maintenance of improvement		5,000.00
Total		[1] 205,000.00

(*b*) *Above Nashville* (*357 miles*).—This section extends from Nashville to the mouth of Rockcastle River. In its original condition it was considerably obstructed by rock reefs, ledges, snags, etc., which greatly impeded navigation between Nashville and Burnside (about 325 miles), while above Burnside the Smith Shoals formed a serious obstruction to navigation at practically all stages. The general direction of flow of this section is southwest.

The length of the section included in the present project of canalization is about 160 miles. The distance of the lower end of the project from the mouth of the river is about 190 miles.

The original scheme of improvement above Nashville, as modified and extended, contemplated open-channel work from Nashville,

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[1] Exclusive of amount available for fiscal year 1913.

Tenn., to Cumberland Ford (Pineville, Ky.), 497 miles, at an estimated cost of $374,764, and was based on projects submitted January 20, 1871, and February 8, 1872.

The first appropriation specifically applicable to the Cumberland River above Nashville was made by the act of August 14, 1876.

This open-channel scheme of improvement, or old project, resulted in giving increased depths at several of the principal obstructions, thus securing a longer and safer period of navigation. Under this project and its modifications appropriations aggregating $346,000 were made and expended.

The project for the canalization of the Cumberland River above Nashville, based on reports of an examination and survey in 1882 and 1883, was adopted by the river and harbor act of August 5, 1886 (Annual Report, Chief of Engineers, 1884, p. 1661).

This scheme of improvement provided for the construction of 22 locks and dams below Burnside, Ky., and 6 locks and dams at Smith Shoals, above Burnside, the intention being to provide a complete system of lockage from Nashville, Tenn., to Rockcastle River, so as to afford a channel depth of 6 feet, the locks to be 52 feet wide and 280 feet long, with lifts varying from 10 to 12 feet, at an estimated cost of $8,500,000.

On February 26, 1906, the Board of Engineers for Rivers and Harbors reported on the project of canalization as follows:

> The board is of the opinion that the regulation of the river and * * * the completion of Locks and Dams 3, 4, 5, 6, and 7 above Nashville, so as to carry the improvement of the river from its mouth to Carthage, Tenn., is worthy of being continued by the United States, but that the construction of the locks and dams proposed between Carthage and Burnside, except No. 21, now under contract, is not at present justified by the commerce involved.

The river and harbor act of March 2, 1907, adopted the modified project for completing the improvement in accordance with this report by providing for the completion of Locks and Dams Nos. 3, 4, 5, 6, and 7 at an additional expenditure of $550,000, thus reducing the cost of the project as modified to $2,769,000, increased in the report for 1908, page 1690, to $2,854,000. The entire amount so authorized has been appropriated.

The river and harbor act of March 3, 1905, authorized the Cumberland River Improvement Co., of Kentucky, to improve the Cumberland River and tributaries (including the South Fork) above Burnside, Ky., at its own expense, by the construction of the necessary locks and dams under Government supervision. The corporation is granted the use of the resulting water power, subject to the terms of the act, and is required to commence work within 18 months after the completion of Lock No. 21.

The river and harbor act of July 25, 1912, made an appropriation of $5,000 for maintenance of improvement by open-channel work and $2,500 for purchase of flowage rights over lands submerged as a result of the construction of Dams Nos. 6 and 7.

References to examination or survey reports.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Reconnoissance from Falls of the Cumberland to Nashville.[1]					1871	460
Survey, Burnside, Ky., to Nashville.[1]					1872	461-465
Survey, Smith Shoals[1]					1875	795
Falls of the Cumberland[1]					1879	142, 1279
Survey for canal around Smith Shoals.[1]					1882	1868
Examination of the Cumberland and principal tributaries, above Pineville, Ky.[1]					1884	1661
Between Lock 7 and 21[1]	House	699	Fifty-ninth	First		
Do.[1]	do	632	Sixty-first	Second		
Lock No. 20[1]	do[2]	8	Sixty-second	do		

[1] No maps.

[2] Committee document.

The expenditures during the past fiscal year, amounting to $105,509.55, were principally for the completion and placing in operation of Lock 21, riprapping the banks at Locks Nos. 6 and 7, excavating the channel at shoal places between Locks 4 and 7, snagging operations (maintenance), purchase of a boat yard near Nashville, and contingencies pertaining to the entire improvement. Under the project of canalization appropriations and allotments aggregating $2,959,000 have been made; $579 have been received from recoveries, etc., making a total of $2,959,579. Of this amount, $52,036.95 is chargeable to maintenance, leaving $2,907,542.05 applicable to works of improvement. The total expenditures under this project to June 30, 1912, amount to $2,894,154.27, of which sum about $49,230.94 were applied to maintenance.

The expenditures have resulted in an improved channel way by the periodical removal of snags and other surface obstructions; the completion and operation of Locks and Dams Nos. 1 to 7 and No. 21, the latter lock having been opened to navigation in October, 1911.

The completion of Locks and Dams Nos. 1 to 7 has resulted in a good harbor at Nashville and also in affording 6-foot navigation from Nashville to West Point, Tenn., a distance of about 125 miles. After these locks have been longer in operation the effect of the project on freight rates will be more fully apparent. A number of new boats and barges have been placed in commission since the completion of the improvement.

The completion of Lock and Dam No. 21 has resulted in affording steamboat navigation the year round for a distance of 30 miles below Burnside, Ky., and has afforded a fairly good harbor at that locality. This lock has worked a reduction in freight rates of about one-half within the pool area.

The present project of canalizing the rivers above Nashville as far as approved by Congress is practically completed.

The river is navigable from Nashville, Tenn., to West Point, 125 miles, all the year for boats drawing 6 feet; from West Point, Tenn., to Burnside, Ky., 325 miles above Nashville, it is navigable for steamboats of 2½ feet draft from six to eight months and for boats of greater draft from two to three months. Steamboats of light draft can ascend to Burksville, 236 miles above Nashville, for five to eight months and larger boats from four to five months. At fairly low stages, small gasoline boats make occasional trips. The fall is about 223 feet from Burnside to Nashville or about 8 inches per mile. The plane of reference is ordinary low water.

The head of navigation is Burnside, Ky., for steamers and other craft; however, the river for about 35 miles above Burnside is considered navigable for rafting and logging.

The commerce of the Cumberland River above Nashville for the calendar year 1911, as nearly as could be ascertained, aggregated 181,029 short tons, having an estimated value of about $4,087,748; passengers carried, 8,373. The tonnage consisted mainly of timber, farm products, sand and gravel, and general merchandise.

It is proposed to apply the amount required for expenditure in the fiscal year 1914 to work of maintaining the channel above Nashville in a navigable condition by removing surface obstructions.

July 1, 1911, balance unexpended		$170,924.78
Amount received from sales		9.50
		170,934.28
June 30, 1912, amount expended fiscal year:		
For works of improvement	$100,324.19	
For maintenance of improvement	5,185.36	
		105,509.55
July 1, 1912, balance unexpended		65,424.73
July 1, 1912, outstanding liabilities		4,829.81
July 1, 1912, balance available		60,594.92
Amount appropriated by river and harbor act approved July 25, 1912		7,500.00
Amount available for fiscal year ending June 30, 1913		68,094.92
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 5,000.00

(See Appendix B B 2.)

3. Operating and care of locks and dams on Cumberland River.—Nine locks are now in operation: Lock A, the first of the series below Nashville, and Locks Nos. 1, 2, 3, 4, 5, 6, 7, and 21 of the series above Nashville. Locks B, C, D, E, and F are still to be built, which will complete the present project of canalization of the Cumberland River.

They have an available length of 280 feet, a clear width of 52 feet between walls, and a depth of 6½ feet on miter sills at low water, except at lower miter sill of Lock A, where the present low-water depth is only 1 foot. This depth will be increased to 6½ feet by the construction of the next lock below.

The first allotment from the indefinite appropriation of July 5, 1884, for the operation and care of these locks was made June 26, 1905.

During the calendar year 1911 the tonnage passing the locks now in operation was as follows as nearly as could be ascertained: Lock

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[1] Exclusive of amount available for fiscal year 1913.

A, 75,203 short tons; Lock No. 1, 92,398 short tons; Lock No. 2, 110,646 short tons; Lock No. 3, 101,844 short tons; Lock No. 4, 103,000 short tons; Lock No. 5, 93,301 short tons; Lock No. 6, 95,169 short tons; Lock No. 7, 89,918 short tons; Lock No. 21, 5,796 short tons (since October, 1911).

The funds expended were applied principally to quarrying stone for bank protection, riprapping banks, removing sediment from the lock pits, dredging in lock approaches, the construction of four barges and the construction of two derrick boats and general work of operating and caring for the locks, dams, buildings, and grounds.

The amount expended to June 30, 1912, was $225,215.54, of which $98,673.62 were expended during the past fiscal year.

For the statement relative to the necessity for raising the walls of the locks, see report of the Chief of Engineers for 1911, pages 717 and 2034–2036. Contracts were let for furnishing the cut stone for raising the walls of locks 2 and 3; for furnishing the filling valves, anchorages, etc., for Lock No. 2; and also for the delivery and erection at Lock 2 of the entire steel work required for raising the leaves of the lock gates and adjusting and rehanging the gates.

During the past fiscal year 20 claims have been filed by private persons as a result of the overflowing of certain of their lands along the river, due to the raising of the water level by Dam A and by Dams Nos. 5, 6, 7, and 21. These claims (except in four cases where claimants failed to state amount) aggregate $33,825. An investigation in the field was made under the direction of the district officer of 16 of the claims, and the total damages were estimated to be $5,497.50. Eight of the claims pertaining to Dam 21 are pending in the Court of Claims and two pertaining to Dam A are pending in Congress.

Negotiations are now pending to acquire by purchase the flowage rights over certain lands near Locks and Dams Nos. 6 and 7, referred to on page 2031 of the Annual Report of the Chief of Engineers for 1911, the claimants, with the exception of two whose claims are pending in the Court of Claims, having agreed to sell their rights for the amount of the damages as ascertained by the district officer and as stated in the report cited.

During the past fiscal year the city of Nashville purchased 330 feet of ground fronting the river to be used for wharf purposes in the lower part of the city. Some time ago the city sold about 125 feet of river front, but the strip just purchased will give increased wharf facilities over former conditions and will afford greater convenience to vessels in loading and unloading at the locality known as the "lower wharf."

(See Appendix B B 3.)

IMPROVEMENT OF RIVERS AND HARBORS IN THE CHATTANOOGA, TENN., DISTRICT.

This district was in the charge of Maj. William W. Harts, Corps of Engineers, until July 24, 1911; in the temporary charge of Maj. C. A. F. Flagler, Corps of Engineers, from July 24, 1911, to October 21, 1911; in the charge of Maj. Edgar Jadwin, Corps of Engineers, from October 21, 1911, to December 11, 1911; and in the charge of Maj. H. Burgess, Corps of Engineers, since the latter date. Division Engineer, Lieut. Col. H. C. Newcomer, Corps of Engineers.

TENNESSEE RIVER SYSTEM.

The Tennessee River is 652 miles long. It is formed by the junction of the French Broad and Holston Rivers, 4.5 miles above Knoxville and 188 miles above Chattanooga, and flows into the Ohio at Paducah, 464 miles below Chattanooga. Together with its principal tributaries it forms a system of internal waterways capable of being navigated more than 1,300 miles by steamboats. In addition to this, its tributaries are still farther navigable by rafts and flatboats for a distance of more than 1,000 miles, thus making a system of navigable waters about 2,350 miles in length, with a drainage area of about 44,000 square miles.

The river is navigable the entire year from the mouth to Hamburg, Tenn., about 200 miles, with 4 to 5 feet draft, and 26 miles farther to Riverton, Ala., with 3 feet draft. Just above Riverton a lateral canal about 8 miles long has just been completed past the Colbert and Bee Tree shoals, and the Muscle Shoals Canal now surmounts the Big Muscle and Elk River shoals.

Under the act of April 26, 1904, as amended by act of January 7, 1905, a lock and dam to be built mainly by private parties are projected at Hales bar, designed to form a pool extending 33 miles upstream to Chattanooga. At dead low water at present 2 feet draft is all that can be carried from Riverton 238 miles to Chattanooga, and 18 inches is all that is available from Chattanooga the next 188 miles upward to its head.

Local boat lines have headquarters at the principal towns along the river. There is no through traffic covering the entire length of the river, the longest regular boat service being found between Chattanooga and Paducah when the stage of water permits.

Freight rates are said to be already considerably lowered by this project, but there is no information available indicating to what extent they will be affected by its completion.

1. *Tennessee River.*—The improvement has been carried on in three sections under separate appropriations until the existing project was adopted by the act of July 25, 1912.

(*a*) *Above Chattanooga, Tenn.* (*188 miles*).—In its original condition this part of the river was obstructed by rock reefs, bowlders, gravel bars, and snags. The depth of water on the bars varied from 10 to 30 inches at low water, and in some places the current was as great as 6 miles an hour. The average slope is 0.956 foot per mile, with average low-water discharge varying from about 3,000 cubic feet per second at Knoxville to about 6,000 cubic feet per second at Chattanooga.

The general direction of flow is southwest.

Early projects, between 1832 and 1856, seem confined to obtaining a low-water depth of 2 feet by means of wing dams and dredging. In 1871 a project was adopted providing for 3 feet at low water between Chattanooga and Knoxville at an estimated cost of $175,000.

Up to June 30, 1895, the sum of $328,255.83 had been expended under a previous project, and there remained 55 obstructions having less than 3 feet depth at low water.

The project, adopted by Congress in act of August 18, 1894, is based on the survey report printed as House Document No. 252, Fifty-second Congress, second session, and is to obtain by training walls, wing dams, and dredging a low-water channel 3 feet deep from Chattanooga to the mouth of the French Broad River, at an estimated cost of $650,000. A revision of the estimate in 1907, on a basis of present unit prices, places the cost of the existing project at $1,709,000.

The published reports of examinations and surveys of the Tennessee River above Chattanooga are as follows:

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Examination between Chattanooga and Knoxville, Tenn.[1]	House	76	Forty-second	Second	1872	488
Survey from Chattanooga to the junction of the Holston and French Broad.[1]	do	252	Fifty-second	do	1893	2333
This section included in survey from confluence of Holston and French Broad to mouth of Tennessee.[2]	do	360	Sixty-second	do		

[1] No maps. [2] Contains maps.

The river and harbor act, approved July 25, 1912, adopted a project, based on the recommendation contained in House Document No. 360, Sixty-second Congress, second session. The existing project is as follows: (*a*) Construction of lock and dam at foot of Caney Creek Shoals (including cost of flowage rights) suitable for a 6-foot navigation, at an estimated cost of $1,600,000; (*b*) open-channel work to secure a navigable depth of 3 feet at extreme low water and 4 feet at ordinary low water, at an estimated cost of $1,000,000.

Operations in recent years have been confined to Little River Shoals, a serious obstruction 12 miles below Knoxville, the obstruction extending from Caney Creek Shoals for a distance of 8 miles downstream, and the shoals in the stretch of the river between Knott Landing (about 80 miles above Chattanooga) and the mouth of Richland Creek (about 40 miles farther downstream).

The expenditures during the fiscal year 1912, amounting to $90,967.73, were applied to rock excavation, dredging, and dike construction at Kelly Shoals and Watts Bar, and the construction, repair, and care of floating plant. This included payment of $15,978 for a new dipper dredge, the *Tellico*, which was constructed under contract for furnishing the hull, machinery, and equipment complete. With two complete dredging outfits at work, the rate of progress on the work undertaken during the present working season has been greatly increased over that attained in the past.

Appropriations and allotments under the present project amount to $538,504.54, and the receipts from sales, etc., have been $170, making a total of $538,674.54.

The total amount expended under the present project to June 30, 1912, is $481,593.19, including $68,946.63 for maintenance. The expenditures have resulted in improved conditions of navigation at some of the worst localities of this section of the river, notably at Caney Creek, Little River, and Kelly Shoals.

The commerce reported on this section of the river for the calendar year 1911 amounted to 394,176 short tons, valued at about $2,856,227. The quantities of the various items included in this traffic were sand and gravel, 135,057 tons; iron ore, 122,359 tons; logs (mainly rafted), 33,685 tons; marble, 42,936 tons; farm products, 19,401 tons; miscellaneous commodities and general merchandise, 40,738 tons. The effect of the project on freight rates is not yet fully apparent.

In accordance with the new project adopted by the river and harbor act of July 25, 1912, it is proposed to expend about $15,000 in making a location survey for the lock and dam at the foot of Caney Creek Shoals and the balance in open-channel work and purchase of necessary plant. It is recommended that the sum of $200,000 be provided for the fiscal year 1914 to be applied to the purchase of necessary floating plant, dredging, rock excavation, and dike construction; $10,000 for maintenance; and an initial appropriation of $300,000 be made for the construction of the newly projected lock at the foot of Caney Creek Shoals, with a contract authorization for the entire balance of the estimate for its completion. The appropriation recommended is for the extension of benefits and also to make the improvements available.

TENNESSEE RIVER ABOVE CHATTANOOGA.

July 1, 1911, balance unexpended		$148,049.08
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$80,967.73	
For maintenance of improvement	10,000.00	
		90,967.73
July 1, 1912, balance unexpended		57,081.35
July 1, 1912, outstanding liabilities		10,494.88
July 1, 1912, balance available		46,586.47
Amount appropriated by river and harbor act approved July 25, 1912		105,000.00
Amount available for fiscal year ending June 30, 1913		151,586.47
Amount (estimated) required to be appropriated for completion of existing project		[1] 2,500,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 510,000.00

(*b*) *Chattanooga, Tenn., to Riverton, Ala.* (*238 miles*).—In its original condition the channel from Chattanooga to Browns Ferry was obstructed by bars, bowlders, reefs, and rocky projections. Navigation was possible during six to nine months annually. Between Browns Ferry and Florence were the Muscle Shoals obstructions, which could be crossed only at unusually high water. Between Florence and Riverton the Colbert and Bee Tree Shoals prevented navigation for six months in the year.

The average slope is 1.5 feet per mile from Chattanooga to Scott Point (17.5 miles), thence 0.4 foot per mile to head of Muscle Shoals Canal (158 miles), thence 2.73 feet per mile to Riverton (62.5 miles), with average low-water discharge varying from about 6,000 cubic feet per second at Chattanooga to about 10,000 cubic feet per second at Riverton. The general direction of flow is west.

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[1] Exclusive of amount available for fiscal year 1913.

Under a former project the Muscle Shoals section was improved, at a cost of $3,191,726.50, by some channel work at Little Muscle Shoals and by the construction of a lateral canal in two divisions, one on the left bank about 3.5 miles long, with 2 locks, around the Elk River Shoals, and the other on the right bank, about 14.5 miles long, with 9 locks, around the Big Muscle Shoals. This work was done mainly from 1875 to 1890, under a project adopted originally in 1868.

Expenditures aggregating $595,532.74 have been made in the improvement of the open river at various localities between Chattanooga and Riverton under a former project, dating back to 1868, which contemplated securing a least depth of 3 feet at low water in the improved channels.

The projects for the improvement of this section prior to that adopted by the act of July 25, 1912, were three in number:

The first authorizes the construction by private interests of a lock and dam at Hales Bar, about 33 miles below Chattanooga, which will form a pool extending several miles above Chattanooga with a depth of at least 6 feet at low water, the company doing the work being granted the use of the water power produced by the dam for a period of 99 years. The project was adopted by act of April 26, 1904, amended (as to location of the work) by act of January 7, 1905. The terms of the act required that the United States should prepare the plans, supervise the construction, and provide the gates, valves, operating machinery, and other appurtenances of the lock. The revised estimate of the total cost to the United States was $214,720. There has been no modification of project since its adoption.

The second project, adopted by act of March 2, 1907, and based on the report of the survey from Scott Point to Lock A, printed as House Document No. 50, Fifty-seventh Congress, first session, provides for open-channel work. As extended in scope by the act of June 25, 1910, it contemplates securing a depth of 5 feet at low water between Chattanooga and Riverton, with the exception of the intervals covered by the Hales Bar lock and dam, the Muscle Shoals Canal, and the Colbert Shoals Canal. The revised estimate of the total cost of this project was $1,481,500, exclusive of sums appropriated prior to March 2, 1907.

The third project provides for the improvement of Colbert and Bee Tree Shoals, near the downstream limit of this section, by the construction of a lateral canal about 8 miles long, with one lock of about 26 feet lift, at an estimated cost of $2,847,009.70. The original project, based on the report of a board of engineer officers (Oct. 28, 1890), was approved by the Secretary of War on November 28, 1890, and its last modification on June 12, 1905.

The river and harbor act approved July 25, 1912, modified the project in accordance with recommendations in House Document 360, Sixty-second Congress, second session; the proposed modified project being as follows: (*a*) Between Chattanooga and Browns Island, lock and dam at Crow Creek Island, and open-channel work to secure a depth of 6 feet at ordinary low water (5 feet at extreme low water), with permanent works for a 7-foot depth (extreme low water occurs seldom and then for only a few days at a time), estimated to cost $3,000,000; (*b*) between Florence and Riverton, open-channel work to secure a depth of 6 feet at ordinary low water (5 feet at extreme low water), at an estimated cost of $500,000. The estimates made for the work on the stretch of river between Florence and Colbert Shoals, as given in House Document No. 360, Sixty-second Congress, second session, were based on low water assumed in survey made in 1891.

Reports of examinations and surveys made in the section between Chattanooga and Riverton have been published as follows:

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Survey of Muscle Shoals	House	284	Twentieth	First		
Survey from Chattanooga to the mouth.	do	271	Fortieth	Second	1868	[illegible]
Resurvey of Muscle Shoals section, Browns Ferry to Florence.[1]					1872	495
Examination between Guntersville and Browns Ferry, and resurvey of Elk River Shoals.[1]					1877	589
Survey of Colbert Shoals [1]					1887	1747
Examination of Moccasin Bend (to determine advisability of constructing a canal across it).[1]	House	168	Fifty-sixth	First	1900	3005
Survey between Chattanooga and Scott Point.[1]	do	461	do	do	1900	2956
Survey between Bridgeport and Decatur (preliminary report).[1]	do	577	do	do	1900	3082
Survey between Scott Point and Lock A.[1]	do	50	Fifty-seventh	do	1902	1743
This section included in survey from confluence of Holston and French Broad to mouth of Tennessee.[2]	do	360	Sixty-second	Second		

[1] No maps.

[2] Contains maps.

A map of the Muscle Shoals stretch is published in the annual report of 1882, page 1840, and one of Colbert and Bee Tree Shoals in the report of 1898, page 1900.

Hales Bar.—During the past fiscal year the sum of $35,094.76 (which does not include $127.05 expended for the Isthmian Canal Commission) was expended, which was applied principally to the cost of erecting the upper and lower lock gates under contract and to the cost of inspection of construction of the lock and dam under contract.

Appropriations and allotments under this project (Hales Bar Lock and Dam) amount to $229,720; $18.29 was received from other sources, making a total of $229,738.29, of which sum $144,720.35 has been expended to June 30, 1912. This is exclusive of the $127.05 expended for the Isthmian Canal Commission, for which a transfer settlement has not yet been made. The percentage of completion of the various parts of this work may be found in Appendix C C 1. The present time for the completion of this work is April, 1913. This improvement will not be available until completed. The entire amount estimated to be required for the completion of the work to be done by the United States in connection with the Hales Bar improvement has been appropriated.

Open-channel work.—During the past fiscal year the sum of $145,730.88 was expended, which was applied principally to rock excavation and dredging at Tuscumbia Bar and Buck Island Shoals, and to the maintenance and construction of floating plant, including a new dipper dredge, on which payments were made during the fiscal year of about $38,000, of which $20,000 was paid under a contract for the machinery. These localities are considered the worst obstructions in the middle section of the Tennessee River.

Appropriations and allotments under this project (for open-channel work) amount to $616,674.24; $56.63 was received from other sources, making a total of $616,730.87, of which sum $417,662.70 has been expended to June 30, 1912. Of the latter amount $26,997.02 has been expended for maintenance. The expenditures have resulted in the improvement of the open-river channel at various points between Chattanooga and Riverton, notably at Allens Bar, Burdine Bar, Tuscumbia Bar, and Buck Island Shoals.

The maximum draft that can be carried at mean low water over the shoalest places between Chattanooga and Riverton is about 2 feet. The extreme flood oscillations range from about 69 feet at the Suck, 12 miles below Chattanooga, to about 10 feet at Lock 4 of the Muscle Shoals Canal.

The river freight reported as having been handled on this section in the calendar year 1911 amounted to 60,360 short tons of timber products, 20,840 short tons of merchandise, 108,244 short tons of sand and stone, and 18,976 short tons of farm products. In addition, the Nashville, Chattanooga & St. Louis Railway, which operates a car ferry between its terminals at Hobbs Island, on the north bank, and Guntersville, on the south bank (22 miles upstream), handled 83,600 tons of rail freight by means of transfer boats (without unloading from cars), making a total commerce in the section between Chattanooga and Florence of 292,020 tons, valued at approximately $11,151,471. The effect of this project on freight rates will not be fully apparent until the completion of the work of improvement between Florence and Riverton.

The river and harbor act of July 25, 1912, carries an appropriation of $10,000 for the section "between Chattanooga and Browns Island" and $120,000 for the section "between Florence and Riverton." It is proposed to expend the $10,000 above mentioned for maintenance and in making the lock-location survey for the lock and dam at Crow Creek Island, and the $120,000 to open-channel work and contingencies.

It is recommended that $485,000 be provided for the fiscal year 1914 for the section from Chattanooga to Riverton, to be applied as follows: $100,000 to open-channel work in the section between Chattanooga and Browns Island; $100,000 to open-channel work in the section between Florence and Riverton; $10,000 for maintenance; and $275,000 to the construction of the lock and dam between Chattanooga and Browns Island, with a contract authorization for the entire balance of the estimate for the completion of the lock and dam, in order that the work may be prosecuted to completion at the earliest date practicable. The appropriation is required in order that the improvements may be made available and also for the extension of benefits.

Colbert Shoals Canal.—During the past fiscal year the sum of $54,117.13 was expended, which was applied principally to the work of erecting the guard gates under contract, installing sluice-valve operating machinery, and to bank protection. The canal, although not quite completed, was opened to navigation in November, 1911.

Appropriations and allotments under the present project amount to $2,313,000; $9,132 was received from other sources, making a total of $2,322,132, of which sum $2,320,163.11 has been expended to June 30, 1912.

The expenditures have resulted in placing the canal in operation. Some additional work will be necessary at this place for the purpose of properly protecting the canal. Attention is invited to the remarks in this connection in the annual report for 1911, pages 722 and 2048. Negotiations are now pending for the purchase of 15 acres of land at the canal for the purpose of making certain improvements for protecting the canal embankment against erosion during high stages of the river, and also for furnishing additional mooring space for vessels using the canal. This subject was treated in detail in the appendix to the annual report for 1911, page 2049.

For statement of commerce through the canal since its opening, see Appendix C C 1 of this report. The effect of this work on freight rates is not yet apparent.

HALES BAR LOCK AND DAM.

July 1, 1911, balance unexpended		$120,112.70
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$25,577.29	
For Isthmian Canal Commission	123.05	
For maintenance of improvement	9,521.47	
		35,221.81
July 1, 1912, balance unexpended		84,890.89
July 1, 1912, outstanding liabilities		1,318.14
July 1, 1912, balance available		83,572.75

CHATTANOOGA TO RIVERTON.

July 1, 1911, balance unexpended		$344,799.05
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$135,730.88	
For maintenance of improvement	10,000.00	
		145,730.88
July 1, 1912, balance unexpended		199,068.17
July 1, 1912, outstanding liabilities		27,394.39
July 1, 1912, balance available		171,673.78
Amount appropriated by river and harbor act approved July 25, 1912		130,000.00
Amount available for fiscal year ending June 30, 1913		301,673.78
July 1, 1912, amount covered by uncompleted contracts		4,000.00
Amount (estimated) required to be appropriated for completion of existing project		[1] 3,370,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1, 2] 485,000.00

COLBERT AND BEE TREE SHOALS.

July 1, 1911, balance unexpended	$56,086.02
June 30, 1912, amount expended during fiscal year for works of improvement	54,117.13
July 1, 1912, balance unexpended	1,968.89
July 1, 1912, outstanding liabilities	13.00
July 1, 1912, balance available	1,955.89

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[1] Exclusive of amount available for fiscal year 1913.

[2] Including $275,000 toward the construction of lock and dam.

(*c*) *Below Riverton, Ala.* (*226 miles*).—This section of the river lies below most of the large tributaries, and the slope being uniform and moderate and the width nowhere excessive it affords unusual facilities for navigation. The general direction of the flow is north. The ruling low-water depths were originally about 3.5 feet over the lower 196 miles and 2 feet in the remaining portion. The average slope is 0.34 foot per mile, and the low-water discharge is about 10,000 cubic feet per second. In 1896 there were 49 localities having less than 5 feet depth at low water, and several other shoals have since developed.

The existing project, originally adopted September 19, 1890, and subsequently extended in its scope by the acts of August 18, 1894, and March 3, 1899, is to obtain, by dredging, a channel not less than 5 feet deep and 150 feet wide, and to protect Livingston Point and Tennessee Island from erosion with a view to preserving the port of Paducah, Ky.

A survey of this portion of the river was made pursuant to an act of Congress of August 18, 1894, but no definite plan of improvement appears to have been recommended at the time further than a suggestion that channel excavation by dredging should be given a trial. The present plan is the outcome of the successful application of this method.

The published reports of examinations and surveys pertaining to the Tennessee River below Riverton are as follows:

Sections covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Survey from Chattanooga to the mouth.	House	271	Fortieth	Second	1868	560
Examination of Paducah Harbor [1]					1885	1890
Survey of Livingston Point [1]					1891	2256
Examination of Livingston Point and Tennessee Island.[1]					1896	2301
Survey from Riverton to mouth, 1896 (no detailed report submitted).[1]					1897	2263
Survey of mouth of Tennessee River [1]	House	19	Fifty-fifth	First	1897	2314
Survey of Paducah Harbor [1]	do	644	Fifty-sixth	do	1900	3220
Survey of Tennessee River from confluence of French Broad and Holston Rivers to mouth.[2]	do	360	Sixty-second	Second		

[1] No maps.

[2] Contains maps.

The river and harbor act approved July 25, 1912, adopted a modification of the present project, based on report printed in House Document No. 360, Sixty-second Congress, second session, as follows: Open-channel work to secure a depth of 6 feet at ordinary low water (5 feet at extreme low water), estimated to cost $600,000.

There were no active operations carried on during the fiscal year 1912, the amount expended ($68,727.52) being applied to payments for floating plant, including the dredges *Watauga* and *Tishomingo*. These vessels being practically completed during the fiscal year. It was intended to use these vessels in connection with rock excavation at Big Bend Shoals (just above Hamburg, Tenn.), the most formidable obstruction below Riverton, but it was found advantageous to transfer them to the middle section of the river, where they can be used effectively, pending an effort to let the Big Bend work by contract. Should no satisfactory bid be received, the work will be done by hired labor, for which considerable additional floating plant will be necessary.

The appropriations and allotments for this section amount to $634,197.74, and sums aggregating $849.89 have been received from other sources, making a total of $635,047.63.

The total amount expended to June 30, 1912, was $534,051.92, including about $85,028.65 for maintenance. These expenditures have resulted in the completion of the work at Livingston Point and Tennessee Island at a cost of $83,501.65, including maintenance; in the removal of snags and the dredging of approximately 1,661.420 cubic yards of gravel at about 35 localities, thus removing the worst obstructions below Hamburg (about 26 miles below Riverton, Ala.); and in providing and maintaining the dredging plant required in carrying on the improvement. The results of the dredging operations appear to be fairly permanent at nearly all of the places improved.

The maximum draft that can be carried over the shoalest place in this section at mean low water is about 3 feet. The extreme flood oscillations range from about 48 feet at Johnsonville to about 55 feet at Paducah.

The commerce carried on the river between Florence and Paducah in the calendar year 1911 amounted to about 431,113 short tons, the total value of which was estimated at $7,394,412. The item of railroad ties constituted nearly three-fifths of the tonnage, other timber products amounted to 67,776 short tons, farm products to about 23,493 short tons, and miscellaneous merchandise to about 40,609 short tons.

It is proposed to expend the amount carried by the river and harbor act of July 25, 1912, to work of improvement at Big Bend Shoals. The sum of $110,000 should be provided for 1914, to be expended in continuing improvement at Big Bend Shoals and for maintenance.

BELOW RIVERTON.

July 1, 1911, balance unexpended	$168,857.23
June 30, 1912, amount expended during fiscal year, for works of improvement	68,727.52
July 1, 1912, balance unexpended	100,129.71
July 1, 1912, outstanding liabilities	4,978.59
July 1, 1912, balance available	95,151.12
Amount appropriated by river and harbor act approved July 25, 1912	110,000.00
Amount available for fiscal year ending June 30, 1913	205,151.12
July 1, 1912, amount covered by uncompleted contracts	8,345.00
Amount (estimated) required to be appropriated for completion of existing project	[1]490,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1]110,000.00

(See Appendix C C 1.)

2. *French Broad and Little Pigeon Rivers, Tenn.*—The French Broad River is one of the largest tributaries of the Tennessee. It

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[1] Exclusive of amount available for fiscal year 1913.

rises in North Carolina, flows in a generally northwesterly direction, and finally unites with the Holston River in the State of Tennessee, about 4.5 miles above Knoxville, to form the Tennessee River. It has a drainage area of about 5,600 square miles. Leadvale, Tenn., about 70 miles above the mouth, has generally been considered the head of navigation in Tennessee, and it is not believed that rafting or logging is practicable to any great extent above this point. An isolated portion of the river in North Carolina, between Brevard and Asheville, was under improvement for several years, from 1877 to 1882, and $43,000 was expended in removing obstructing bowlders, fish traps, and snags, and in dredging and constructing wing dams at Cherokee, Big Buck, and other shoals.

In its original condition the river was obstructed by rock reefs, sand and gravel bars, and by bowlders, snags, and overhanging trees, and numerous islands in the river divided the water and diminished the depth in the navigable channels. There were 41 shoals obstructing navigation below Leadvale. The average slope below Leadvale is about 2.3 feet per mile, and the low-water discharge at Leadvale is reported as about 2,000 cubic feet per second.

The Little Pigeon River is formed by the junction of its east and south forks at Sevierville, Tenn., and flows in a northerly direction for about 5 miles, emptying into the French Broad about 29 miles above its mouth. The Little Pigeon is navigable at ordinary stages only about 2 miles above its mouth (to Catlettsburg), and thus practically amounts to an additional landing on the French Broad. In its original condition this portion of the river was obstructed by a bar at its mouth.

The present project, based on the survey of 1870 (Annual Report, 1871, p. 491), was adopted June 14, 1880, and provides for open-river work on the French Broad to secure a navigable channel at low water from the mouth to Leadvale sufficient to permit the passage of boats drawing about 2.5 feet, at an estimated cost of $150,000, and for the removal of the bar at the mouth of the Little Pigeon.

Examinations and surveys have been made as follows:

Sections covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Examination of French Broad River, Tenn.[1]	....	....	....	....	1871	491
Examination of French Broad River, N. C. (Brevard to Buncombe county line).[1]	....	....	....	....	1875	817
Examination of French Broad River, N. C. and Tenn. (Buncombe County line to junction with the Holston).[1]	....	....	....	....	1876	718
Examinatiton of French Broad River, N. C. (Brevard to Asheville).[1]	....	....	....	....	1878	525
Examination of Little Pigeon River.[1]	....	....	....	....	1891	2288
Survey of French Broad River, Tenn.[1]	House	616	Fifty-sixth	First	1900	3019
Examination in North Carolina, authorized by act of June 25, 1910.[2]	....	....	....	....	....	....

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[1] No maps.

[2] Not yet published; officer's report transmitted under date of Dec. 21, 1911.

No modification has been made since the adoption of the present project.

The funds expended in the fiscal year 1912, amounting to $11,834.04, were applied to dike construction and channel excavation at Seven Island Shoals, and to repair work, maintenance, and other incidentals pertaining to this improvement. The completion of this work will remove the most serious obstruction to navigation between Dandridge and the mouth of the river. About 50 per cent of the work required at this point has been completed.

To June 30, 1912, $170,000 had been appropriated and allotted for this improvement in both North Carolina and Tennessee, and $503.01 had been received from other sources, making an aggregate of $170,503.01.

The amount expended to June 30, 1912, for work in the State of Tennessee was $126,894.51, of which $17,029.84 was for maintenance. These expenditures have been applied to the improvement of some 16 shoal places in the French Broad River, the maintenance of the navigable channel, and the removal of the bar at the mouth of the Little Pigeon River.

The maximum draft that can be carried over the shoalest place at mean low water is probably about 18 inches. The extreme flood oscillation is about 30 feet, ordinary floods having a range of about 10 to 15 feet. Steamboats rarely go above Dandridge, 46.5 miles above the mouth, and all the improvements are below this place. Except at one rock ledge, the low-water channel of 90 feet width and 2.5 feet depth has now been secured from Dandridge down as far as Seven Island Shoals, 32½ miles below, or 14 miles above the mouth.

The commerce carried on the French Broad River in 1911 amounted to 30,224 short tons, valued at $986,740. The direction of traffic is not parallel to rail lines. The effect of the improvement on railroad rates, therefore, would be indeterminate, though doubtless important.

It is proposed to apply the funds estimated for the fiscal year 1914 to open-channel work below Dandridge, with a view to the extension and maintenance of benefits already obtained.

July 1, 1911, balance unexpended		$12,442.54
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$7,889.36	
For maintenance of improvement	3,944.68	
		11,834.04
July 1, 1912, balance unexpended		608.50
July 1, 1912, outstanding liabilities		595.71
July 1, 1912, balance available		12.79
Amount appropriated by river and harbor act approved July 25, 1912		15,000.00
Amount available for fiscal year ending June 30, 1913		15,012.79
Amount (estimated) required to be appropriated for completion of existing project[1]		28,515.64
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1]15,000.00

(See Appendix C C 2.)

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[1] Exclusive of amount available for fiscal year 1913.

3. *Clinch and Hiwassee Rivers, Tenn.*—(*a*) *Clinch River.*—This river rises in the Cumberland Mountains in Virginia, and, after following a southwesterly course, empties into the Tennessee River at Kingston, 104 miles above Chattanooga. It drains an area of about 5,000 square miles. Its average slope below Clinton (60 miles from the mouth) is about 1.3 feet per mile. The ordinary low-water discharge at Clinton is about 900 cubic feet per second. There are about 193 miles of the river in the State of Tennessee.

In its original condition the channel was obstructed by rock reefs, sand and gravel bars, bowlders, snags, and overhanging trees.

The present project, apparently based on the report of examination printed in House Document No. 188, Forty-fourth Congress, first session, was adopted in 1880, and provides for channel excavation, removing surface obstructions, and the construction of wing dams and training walls, so as to secure a navigable channel of 2 feet in depth at ordinary low water from the mouth of the river to Clinton, about 60 miles, and of 1.5 feet in depth from Clinton to Haynes (or Walkers) Ferry, about 66 miles. From Haynes Ferry to the State line, a distance of about 67 miles, it is proposed simply to remove the loose rock and bowlders, reduce the rock ledges, and remove snags, overhanging trees, and similar obstructions, so as to assist raft and flatboat navigation at the stages at which the river is ordinarily used.

The town of Clinton has been reached by small steamboats, and is regarded as the practicable limit of steamboat navigation. Rafts are sometimes floated down from points as far upstream as Speers Ferry, Va., 201 miles from the mouth, but this traffic is diminishing, and it is reported that few rafts now enter the Clinch River above the mouth of Powells River.

The following is a list of the reports of examinations and surveys pertaining to this stream:

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Examinations from mouth of Indian Creek, Va., to junction of Clinch and Powells Rivers, and below Emory River.[1]	House	188	Forty-fourth	First	1876	745
Examinations in Tennessee and Virginia.[1]	do	77	Forty-sixth	Second	1881	1864
Preliminary report of survey in Tennessee.[1]	do	570	Fifty-sixth	First	1900	3065
Final report of survey in Tennessee [2].	do	75	do	Second	1901	2542

[1] No maps.

[2] Contains maps.

No modification has been made in the present project since its adoption.

The expenditures for the fiscal year, amounting to $4,380.14, were applied to channel excavation and dike construction at Clinton Island Shoals. Work was suspended on November 14, 1911, on account of unfavorable weather conditions and has not yet been resumed because of lack of funds.

The sums thus far appropriated and allotted for this stream amount to $61,825.43, and $1.10 additional has been received from sales, making the total receipts $61,826.53.

The amount expended on this project to June 30, 1912, was $59,391.22, exclusive of $140.36 on account of inspections for Isthmian Canal Commission. These expenditures have been applied to reducing reefs, removing surface obstructions, and building wing dams and training walls, whereby the use of the river has been made practicable at stages 2 to 3 feet lower than before the improvement was begun.

There is no information available indicating the extent to which freight rates are affected by this improvement. It seems safe to say that it will necessarily be slight until the time arrives when changed conditions shall have warranted the adoption of a plan for the radical improvement of this stream.

It is proposed to apply the small balance available, together with the $2,000 transferred by the river and harbor act of July 25, 1912, from the Clinch River in Virginia to the Clinch River in Tennessee, to the completion of the works at Clinton Island Shoals, and to the removal of surface obstructions and maintenance of existing improvements.

The commerce reported on the Clinch River for the calendar year 1911 amounted to 23,897 short tons, having a valuation of $194,370.

July 1, 1911, balance unexpended	$6,794.12
Amount received from Isthmian Canal Commission by transfer settlement	21.33
	6,815.45
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	4,380.14
July 1, 1912, balance unexpended	2,435.31
July 1, 1912, outstanding liabilities	28.84
July 1, 1912, balance available	2,406.47

(*b*) *Hiwassee River.*—The Hiwassee River rises in the mountains of western North Carolina and northern Georgia, flows in a northwesterly direction, and enters the Tennessee River about 35 miles above Chattanooga. Its largest tributary is the Ocoee River, which enters it from the south about 35 miles from its mouth. The Hiwassee drains an area of about 2,725 square miles. Its average slope below the Ocoee is about 0.93 foot per mile. The low-water discharge at the mouth of the Ocoee is given as about 950 cubic feet per second.

Before improvement the channel was obstructed by rock reefs, gravel bars, snags, and overhanging trees.

The original project of improvement, based on an examination made in 1874 (Annual Report, 1875, p. 809), was for a navigable channel 40 feet wide and 2 feet deep at ordinary low water to Savannah Ford, about 41.6 miles from the mouth of the river, to be secured by excavation of rock reefs and gravel bars and the construction of wing dams. Expenditures under this project amounted to $36,427.07.

Examinations and surveys of the Hiwassee River have been made and reported as follows:

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Examination from Savannah Ford to the mouth.[1]					1875	809
Examination from its confluence with the Tennessee to the mouth of Ocoee River.[1]	House	27	Fifty-second	Second	1893	2412
Preliminary report on survey from the mouth to the mouth of the Ocoee River.[1]	do	593	Fifty-sixth	First	1900	3011
Final report on survey from the mouth to the mouth of the Ocoee River.[1]	do	77	do	Second	1901	2458

[1] No maps.

The present project, based on the report of survey printed in House Document No. 77, Fifty-sixth Congress, second session, was adopted by the river and harbor act of June 13, 1902, and contemplates the development of a channel of not less than 116 feet width and 30 inches mean depth between the mouth of the river and the mouth of the Ocoee River by use of spur dikes, training walls and submerged sills, bank protection, and dredging, at an estimated cost of $71,125. There were 16 shoals having less than the desired depth at low water.

No modification of the existing project has been made since its adoption.

The funds expended in the fiscal year 1912, amounting to $2,111.85, were applied to channel work at Mathews Shoals, which was completed August 7, 1911. A channel 60 feet wide and 2½ feet deep was obtained at these shoals.

Under the present project funds aggregating $84,855.33 have been received from appropriations and allotments, and $8.23 from sales, making a total of $84,863.56.

The amount expended on the present project to June 30, 1912, was $84,488.21. These funds have been applied to the improvement of the 13 principal shoals below Charleston and to the maintenance of the navigable channel.

While the full channel width has not been secured at every shoal place, the width provided is thought to be everywhere ample for the existing and prospective commerce on this stream; and inasmuch as there is no demand for improved conditions above Charleston, the present limit of steamboat navigation, it is considered that the improvement is practically completed.

The maximum draft that can be carried over the shoalest place at mean low water is about 2 feet. The extreme flood oscillation at Charleston, 19 miles above the mouth, is about 32 feet, but ordinary floods do not exceed about 15 to 18 feet. Small boats of about 100 tons capacity can navigate the river eight months in the year. Savannah Ford, 7 miles above the mouth of the Ocoee River, has at times been reached by steamboats, and is usually regarded as the head of navigation, although at present steamboat traffic does not extend above Charleston. Rafting and logging are not considered practicable above Savannah Ford.

The commerce carried on the Hiwassee River in the calendar year 1911 amounted to 3,717 short tons, valued at about $100,271. It consisted principally of farm products and general merchandise. There is no information available indicating the extent to which freight rates are affected by this improvement. It is probably slight.

July 1, 1911, balance unexpended	$2,487.20
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,111.85
July 1, 1912, balance unexpended	375.35
July 1, 1912, outstanding liabilities	23.04
July 1, 1912, balance available	352.31
Amount appropriated by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	5,352.31

CONSOLIDATED

July 1, 1911, balance unexpended	$9,281.32
Amount received from Isthmian Canal Commission by transfer settlement	21.33
	9,302.65
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	6,491.99
July 1, 1912, balance unexpended	2,810.66
July 1, 1912, outstanding liabilities	51.88
July 1, 1912, balance available	2,758.78
Amount appropriated by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	7,758.78

(See Appendix CC 3.)

4. Operating and care of Muscle Shoals Canal, Tennessee River.—For details of this canal and of its operation and care, also dimensions of locks, aqueduct, and drift sluice, see pages 2440–2446, Annual Report of the Chief of Engineers for 1901, with corrections given on page 1729 of report for 1902.

The canal was opened to navigation in 1890. It is in two sections, aggregating about 18 miles in length, and has 11 locks. A railroad nearly 15 miles in length is operated in connection with the maintenance of the canal.

Fifteen streams empty into the canal, none of them very large. Bars are constantly forming opposite their mouths and also at the entrances to the canal. A bucket dredge is kept on the canal in order to remove these bars as fast as they form.

The freight transported through the canal in the calendar year 1911 amounted to 8,962 short tons, the estimated value of which was $815,890. The number of lockages made, exclusive of those of Government craft, was 1,085.

The amount expended to June 30, 1912, was $1,264,296.87, of which the sum of $52,219.36 was expended during the year.

(See Appendix C C 4.)

5. Operating and care of Colbert Shoals Canal, Tennessee River.—This work consists of a lateral canal nearly 8 miles long on the left bank of the Tennessee River immediately above Riverton, Ala. It has a minimum width of 140 feet at the water surface and a depth throughout of 7 feet, with 6 feet on the miter sills. Boats are passed by means of a single lock (located at the lower end of the canal, one-half mile above Riverton), with a maximum lift of about 26 feet and clear dimensions of 80 feet by 350 feet. The original project was adopted in 1890, and the construction of the lock commenced in 1893.

Although not entirely finished, the canal was opened to navigation in November, 1911. Up to the time of opening the work had cost $2,302,352.61.

The amount expended for operating and care since the time of opening to June 30, 1912, amounts to $7,991.96.

The freight transported through the canal since the opening in November, 1911, amounts to 14,245 short tons, the estimated value of which was $112,603. The number of lockages made, exclusive of Government craft, was 50.

(See Appendix C C 5.)

SURVEY OF THE TENNESSEE RIVER MADE IN COMPLIANCE WITH THE RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

Report dated March 21, 1910, by Maj. Wm. W. Harts, Corps of Engineers, *on survey of the Tennessee River, Tenn., Ala., and Ky., from the confluence of the Holston and French Broad Rivers to its mouth*, required by the river and harbor act approved March 3, 1909, was duly submitted and reviewed by the Board of Engineers for Rivers and Harbors, as required by law. The report was transmitted to Congress and printed in House Document No. 360, Sixty-second Congress, second session. A plan for improvement at a total estimated cost of $6,700,000, with $100,000 annually for maintenance, is presented.

The local officer was also charged with the duty of making a preliminary examination and survey required by the river and harbor act approved June 25, 1910, of *French Broad River, N. C.*, and reports thereon will be duly submitted when received.

IMPROVEMENT OF RIVERS AND HARBORS IN THE FIRST CINCINNATI, OHIO, DISTRICT.

This district was in charge of Lieut. Col. H. Jervey, Corps of Engineers. Division engineer, Lieut. Col. H. C. Newcomer, Corps of Engineers.

1. Ohio River (general open-channel improvement).—This work was commenced by the General Government in 1827, when low-water navigation over many of the bars and shoals was impossible for commercial purposes; but the improvements made and maintained since then have provided fairly convenient channels at such places for a profitable light-draft local freight and passenger service during low-water periods. The difference in level of water surface of the river varies; at Cincinnati, nearly midway between the head and mouth of the river, the average annual range during the past 30 years is 48.6 feet.

The project under which operations have been carried on has been a continuous and progressive one, the principal features of the work being the removal of snags, rocks, and wrecks from the general channel; the direct improvement of bars and shoals, by dredging and rock excavation; the construction, repair, and maintenance of low dikes and dams to concentrate and direct the flow of water in improved channels; bank protection and the construction and repair of levees where required in the interest of navigation; the construction, repair, and maintenance of ice piers and harbors; miscellaneous improvement, including surveys, establishment of harbor lines, regulation of encroachment and deposits on the banks of the river or in its channel, and the supervision of construction of bridges across the river. The length of river through which the work extends is but little short of 1,000 miles, and the total expenditure in this district by the Government during the 85 years it has been in progress, exclusive of liabilities outstanding June 30, 1912, is $6,808,389.32.

The principal operations of the year were as follows: The U. S. dredges *Ohio*, *Oswego*, and *Indiana* excavated 502,573 cubic yards of gravel, sand, etc., 164.6 tons of rock, and 34.4 tons of snags. The hired dredging plants excavated 69,676 cubic yards of gravel, sand, etc., 95.25 tons of rock, 56 tons of logs, and part of 1 coal barge. This dredging has resulted in improvement of the channel, making a depth of from 3 to 6 feet below low water at Clusters Islands, Blacks Island, Deep Run Bar, Paddy Run Bar, Wheeling Creek Bar, Caldwell Run Bar, Captina Island, Fishing Creek, Middle Brother Island, Guyandot Bar, Richmond Bar, Medoc Bar, Four-Mile Bar, Flint Island, Tradewater Bar, Walkers Bar, and Sisters Islands.

On the fixed concrete dam closing the back channel at Buffington Island, under contract dated December 5, 1910, the following work was done and material placed: Excavation, 1,928.9 cubic yards; piles, 83; iron tie-rods, etc., 2,346 pounds; gravel filling, 132.26 cubic yards; stone, ¾ to 3 cubic feet each, 263.23 cubic yards; stone, 9 to 18 cubic feet each, 430.91 cubic yards; concrete masonry, 339.59 cubic yards.

Work of removal of Sand Creek Dike and dredging, under contract of December 9, 1910, was carried on and completed. The total work done under this contract is as follows: Removal of 1,260 linear feet of dike, and channel dredging 20,416 cubic yards.

On the construction of a loose stone dike at Sisters Islands, under contract dated November 17, 1910, the following work was done and material placed: Excavation, 1,338.8 cubic yards; large stone, 110.1 cubic yards; small stone, 2,616.5 cubic yards.

A contract was entered into on June 1, 1912, for building 5 additional loose stone dikes at Sisters Island; the contractor has been preparing stone which will be placed when the river reaches a favorable stage.

On the reconstruction in concrete of Middleport, Ohio, ice pier, under contract dated March 22, 1911, the following work was done and material placed: Removal of three old timber cribs, 90 per cent removed; timber protection, 30,506 feet b. m.; pumping, 15 days;

wrought iron or steel tie-rods, etc., in protection and timber forms, 350 pounds; concrete masonry, 516.4 cubic yards.

Supervision was had of established harbor lines at East Liverpool and Steubenville, Ohio; Wheeling, W. Va.; Ironton and Cincinnati, Ohio. Work on calculations, etc., and on maps of resurvey of Cincinnati, Ohio, harbor lines is in progress.

Nineteen permits were issued to cover the construction of bridges, oil and gas pipe lines, bank protection, dredging, inclines, submarine and overhead cables, intakes, pile clumps, and sheer boom.

A contract was entered into on July 25, 1911, for the construction of three steel and iron hull towboats, and the boats have been practically completed.

Under contracts dated March 15 and August 29, 1911, six fuel barges and three steel flatboats were completed and put in service.

The nature of the Ohio River is such that its improvement, whether by canalization (locks and dams) or open channel, can not bring full benefit to navigation interests until the improvement shall have become more continuous than past appropriations have permitted. The unimproved portions afford less depth of channel than the improved sections and limit available draft for the whole river to that required for passing its shoalest parts. Dredging and snagging operations will be required at many places, even after a complete system of canalization is finished, and for open-channel improvement continuous work and simultaneous operations will be absolutely necessary to produce effective results.

Under approved authority plans are being prepared for, or there are in course of construction, the following additional plant: One dipper dredge and one light-draft snagging plant.

The available depth in the Ohio River varies greatly with the fluctuation in river stages. During the fiscal year the available depth has been about the average.

The fluctuations in river stages are indicated by the following readings from characteristic river gauges:

	Highest.	Date.	Lowest.	Date.	Range.
	Feet.	1912.	*Feet.*	1911.	*Feet.*
Dam No. 6	32.1	Apr. 2	1.5	July 25	30.6
Wheeling, W. Va	38.4	Mar. 23	1.3	July 27	37.1
Parkersburg, W. Va	32.5	Apr. 5	.5	Aug. 1	32.0
Point Pleasant, W. Va	40.8	do		do	40.8
Portsmouth, Ohio	51.0	Mar. 26	1.7	Aug. 3	49.3
Cincinnati, Ohio	53.2	Mar. 27	4.6	July 25	48.6
Louisville, Ky. (lower)	54.3	Mar. 28	3.2	Aug. 16	51.1
Evansville, Ind	42.6	Mar. 31	2.3	Aug. 20	40.3
Paducah, Ky	49.9	Apr. 9-11	1.8	Sept. 5	48.1
Cairo, Ill	54.0	Apr. 7	7.9	Sept. 6	46.1

The available depth in channel may be considered 1 foot greater than gauge readings from Pittsburgh to Louisville and 2 feet greater from Louisville to Cairo.

During the fiscal year no work was done to increase the available depth, but work was confined to the removal of snags and other obstructions and increasing the width of narrow low-water channels, thus bettering navigable conditions.

No estimate can be given of the effect of the improvement thus far made on freight rates. In this connection reference is made to the Report of Ohio River Board (H. Doc. No. 492, 60th Cong., 1st sess.), in which statements are made of present and prospective commerce and the effects of improvements on freight rates, etc.

In order to provide for navigation during comparatively low-water periods in winter, many of the existing dikes and dams will require to be kept in a state of repair, as the movable dams can not safely be operated during a time of even light-running ice, although properly protected steamboats may be able to navigate at such time. The severe losses to floating craft during recent years have shown the importance of maintaining certain of the harbors of refuge afforded by existing ice piers and the providing of others at carefully selected localities.

The commerce of the river during the past year, so far as indicated by statistics that the engineer officer in charge of the rivér has been able to obtain, was as follows: General merchandise, coal, etc., 12,046,294.5 short tons, at an estimated value of $82,074,878.77; passengers, 3,827,365.

July 1, 1911, balance unexpended		$890,676.44
Amount received from sales		175.36
Amount received by transfer from other appropriations		2,969.75
		893,821.55
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$290,481.25	
For maintenance of improvement	15,279.91	
		305,761.16
July 1, 1912, balance unexpended		588,060.39
July 1, 1912, outstanding liabilities		7,533.41
July 1, 1912, balance available		580,526.98
Amount appropriated by river and harbor act approved July 25, 1912		200,000.00
Amount available for fiscal year ending June 30, 1913		780,526.98
July 1, 1912, amount covered by uncompleted contracts		276,090.50
Amount (estimated) required to be appropriated for completion of existing project		[1] Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 550,000.00

(See Appendix D D 1.)

2. *Lock and Dam No. 29, Ohio River.*—The river and harbor act of June 25, 1910, provided for continuing improvement of the Ohio River with a view to securing a navigable depth of 9 feet, in accordance with report submitted in House Document No. 492, Sixtieth Congress, first session, and with a view to the completion of such improvement within a period of 12 years the act made an appropriation of $1,150,000 to be applied to the purchase of sites for 18 locks and dams and toward the construction of certain others.

An allotment from this appropriation of $150,000 was made for the purchase of site and beginning construction of Lock and Dam No. 29.

All the necessary land required has been purchased.

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[1] Exclusive of amount available for fiscal year 1913.

The work was carried on under contract of April 8, 1911, but river conditions were very unfavorable for lock and dam construction.

The cofferdam, 836 feet long and 230 feet wide inclosing the lock chamber and gate recesses was completed, but 75 feet of the outer arm was destroyed by a freshet in June, 1912.

The cofferdam, 380 feet long and 180 feet wide inclosing a section of the navigable pass was started in August, 1911, but was practically destroyed by a freshet in September.

About one-fourth of the earth cofferdam surrounding the lower guide wall was filled.

Excavation of loose material for foundation of lock walls and gate recesses was carried on.

Practically all the metal work required under the contract was furnished and 9,600 barrels of Portland cement stored.

It is estimated that 20 per cent of the work is completed.

The following work was done: 1,370 linear feet of cofferdam, 16 feet above low water; 31,740 cubic yards of common excavation and 9 cubic yards of rock excavation; also 518 hours' extra work by machinists. Metal work delivered: 920,900 pounds structural steel, 26,689 pounds reenforcing rods, 46,291 pounds forgings (including wrought iron), 48,775 pounds bolts, 258,273 pounds iron castings, 181,586 pounds steel castings, and 1,464 pounds bronze.

The total expenditures to June 30, 1912, amounted to $81,906.14.

LOCK AND DAM NO. 29.[1]

July 1, 1911, balance unexpended	$655,998.43
Amount received from sales	11.50
	656,009.93
June 30, 1912, amount expended during fiscal year, for works of improvement	75,836.02
July 1, 1912, balance unexpended	580,173.91
July 1, 1912, outstanding liabilities	385.78
July 1, 1912, balance available	579,788.13
July 1, 1912, amount covered by uncompleted contracts	562,112.82
Amount (estimated) required to be appropriated for completion of existing project	[2]578,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	([3])

(See Appendix D D 2.)

3. *Construction of Lock and Dam No. 31, Ohio River.*—The river and harbor act approved July 25, 1912, provided for continuing improvement of the Ohio River by the construction of locks and dams with a view of securing a navigable depth of 9 feet, making a cash appropriation of $3,200,000 and contract authorization of $2,200,000. Of the funds thus made available $330,000 cash and

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[1] The funds derived from the appropriations and continuing-contract authorizations carried by the river and harbor acts of 1910 and subsequent years are apportioned by the Chief of Engineers to the several locks and dams, after recommendation by the Board of Engineers having general supervision over slack-water improvement of the Ohio River.

[2] Exclusive of amount available for fiscal year 1913.

[3] See p. 1278 of this report.

$370,000 contract authorization has been allotted to Lock and Dam No. 31.

LOCK AND DAM NO. 31.[1]

Amount allotted from appropriation made by river and harbor act approved July 25, 1912	$330,000.00
Amount available for fiscal year ending June 30, 1913	330,000.00
Amount of continuing contract authorization, act of July 25, 1912	370,000.00
Amount yet to be appropriated	370,000.00
Amount (estimated) required to be appropriated for completion of existing project	[2] 990,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	([3])

(See Appendix D D 3.)

4. Lock and Dam No. 37, Ohio River.—The river and harbor act approved June 13, 1902, authorized the construction of this lock and dam at a cost not to exceed $1,050,000 which was increased by act of March 3, 1909, to $1,300,000; all of which has been appropriated.

The lock and dam having been completed, the work was placed under the appropriation for operating and care on January 1, 1911.

The work done during the fiscal year was as follows: Completion of construction of four lock tenders' dwellings; grading lock grounds, planting trees, hedges, etc.; laying tile drains; installing electric light plant; laying 885.6 square yards of cement walk; placing 2,190 cubic yards of earth filling on slopes to repair damage by flood, and completing the work of concrete bank protection on high levels on Ohio side by placing 3,127.3 square yards of concrete facing 6 inches thick resting on a gravel backing. A hired plant dredged through the rock reef below the lock to give a straight approach to the lock, removing 15,764 cubic yards of rock, gravel, etc.

The total expenditures on this work to June 30, 1912, amounted to $1,297,417.25.

July 1, 1911, balance unexpended		$71,729.68
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$69,134.93	
Transferred to other appropriation	10.00	
		69,144.93
July 1, 1912, balance unexpended		2,584.75

(See Appendix D D 4.)

5. Operating and care of Lock and Dam No. 37, Ohio River.—This work was placed under the appropriation for operating and care provided by section 4 of the act approved July 5, 1884, as amended and reenacted by section 6 of the river and harbor act approved March 3, 1909, on January 1, 1911.

The dam was first raised for navigation purposes on July 22, 1911, and remained up until September 2, 1911, when it was lowered.

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[1] The funds derived from the appropriations and continuing-contract authorizations carried by the river and harbor acts of 1910 and subsequent years are apportioned by the Chief of Engineers to the several locks and dams, after recommendation by the Board of Engineers having general supervision over slack-water improvement of the Ohio River.

[2] Exclusive of amount available for fiscal year 1913.

[3] See p. 1278 of this report.

During this period 305 lockages were made for the passing of 441 craft.

The amount expended during the fiscal year was $15,764.96, and the total expenditures, exclusive of outstanding liabilities, amounted to $18,189.04.

(See Appendix D D 5.)

6. Operating snag boats on the Ohio River below the Pennsylvania State line.—The condition of the channel way of the Ohio, the necessity for continuous snag-boat work and the benefits accruing therefrom to river commerce are plainly shown by the yearly reports of obstructions removed, which obstructions, if permitted to remain, would make navigation highly dangerous at ordinary stages and hazardous at any time.

The project for removing obstructions by a properly equipped snag boat was put in operation in 1876, the boat having been completed at a cost of $125,125.24, and the expense of operating having been borne by appropriations for improving Ohio River until 1890. The river and harbor act of September 19, 1890, provided $25,000 yearly for this purpose, and the act of June 3, 1896, increased the yearly appropriation to $50,000.

The amount expended on this work during the fiscal year ending June 30, 1912, was $38,908.48, the total expenditures to the close of the present fiscal year, exclusive of outstanding liabilities, being $713,619.78. For report upon operation of snag boats on the Ohio River in the State of Pennsylvania see page 904, following.

As far as practicable the removal of obstructions is carried on whenever permitted by the stage of water and the absence of dangerous ice, and during the last fiscal year the regular Ohio River snag boat *E. A. Woodruff* was in active service from September 8 to December 11, 1911, and from April 3 to June 30, 1912. She traveled 6,614 miles and removed 441 snags, aggregating 3,176.37 tons; 32 wrecks, comprising 8 coal barges, 22 coal boats, 1 construction barge, 1 ferryboat, *Charles Stone;* and 67 cubic feet of rocks.

The boat was also engaged in lighthouse service on the Ohio River, furnishing 436 light keepers with oil and supplies, attending to 460 lights and day marks, cutting 1,210 trees, and removing 27 acres of brush.

The snagboat *Woodruff*, by which this work was done, is a powerful and finely equipped vessel that does admirable service during moderate stages of water, but can do little or nothing when the river is at a stage of less than 4 feet. Provision was made in the river and harbor act approved June 25, 1910, for the building and equipping of a light-draft snagging plant, consisting of a towboat and a derrick boat, adapted for use at extreme low water stages, which will expedite and economize this class of work. A contract was entered into for its construction.

(See Appendix D D 6.)

7. Raising and strengthening levees at Cairo, Ill.—The river and harbor act approved July 25, 1912, contained the following provision:

> **Improving Ohio River: For raising and strengthening of the levees in the city of Cairo, Illinois, on the Ohio and Mississippi Rivers, and in the Cairo Drainage**

district, which shall be considered extraordinary emergency work, two hundred and fifty thousand dollars: *Provided*, That the city of Cairo shall expend, or cause to be expended, the same amount for the same purpose.

(See Appendix D D 7.)

8. *Raising and strengthening levees at Mound City, Ill.*—The river and harbor act approved July 25, 1912, contained the following provision:

> For the raising and strengthening of the levees in the city of Mound City, Illinois, on the Ohio River, which shall be considered extraordinary emergency work, twenty thousand dollars, on the condition that the city of Mound City shall furnish an equal amount for the same purpose.

(See Appendix D D 8.)

IMPROVEMENT OF RIVERS AND HARBORS IN THE PITTSBURGH, PA., DISTRICT.

This district was in the charge of Lieut. Col. H. C. Newcomer, Corps of Engineers, having under his immediate orders Capt. R. C. Moore, Corps of Engineers, until November 30, 1911, and Second Lieuts. P. B. Fleming, J. W. Stewart, J. C. Mehaffey, and P. S. Reinecke, Corps of Engineers, after June 25, 1912. Division engineer, Lieut. Col. H. C. Newcomer, Corps of Engineers.

1. *Monongahela River, Pa.*—The Monongahela River is formed by the junction of the Tygarts Valley and West Fork Rivers, about 1 mile south of Fairmont, W. Va., and flows in a generally northerly direction about 128 miles to its junction with the Allegheny, forming the Ohio River, at Pittsburgh, Pa. The distance from Pittsburgh to the State line is 91.5 miles, but the improvement of the part of the river in Pennsylvania is considered to extend only from Pittsburgh to the mouth of Dunkards Creek, a distance of 87.5 miles. In its original condition, prior to 1840, it was navigable for steamboats only at high stages. A downstream navigation for light-draft flats and rafts was practicable at high and medium stages. The average fall per mile is about 0.9 of a foot. The drainage area of the Monongahela River Basin is about 7,340 square miles. The minimum discharge is about 160 cubic feet per second, and the highest measured discharge was 197,477 cubic feet per second, on March 15, 1907.

In 1833 Congress provided for a survey of the river from Pittsburgh to Brownsville, a distance of about 57 miles. This survey was not followed by an appropriation for improving the river, and the Legislature of Pennsylvania, by act of March 31, 1836, incorporated and authorized the Monongahela Navigation Co. to improve the river from Pittsburgh to the Virginia State line. This company built seven locks and dams, producing slack water from Pittsburgh to within 2 miles of the State line.

The river and harbor act of June 3, 1896, authorized and directed the Secretary of War to institute and carry to completion proceedings for condemnation of all the property and appurtenances of the company. The property was acquired by the United States on July 7, 1897, at a cost of $3,761,615.46.

The amount expended on original and modified projects prior to operations under existing project was $3,769,073.88, including the purchase money.

The existing project, adopted in 1899, with subsequent modifications (see Annual Report of the Chief of Engineers for 1906, p. 515), provides for the enlargement and improvement of Lock No. 6 and some additional structures at Lock No. 3, for the rebuilding of Locks Nos. 2, 3, and 5, using in each case two parallel chambers, each 56 by 360 feet, and fixed concrete dams with movable tops, and for the acquisition of necessary land and construction of certain improvements at Locks Nos. 5 and 6, all at a total estimated cost of $2,237,605.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Part.	Page.
Pittsburgh to Brownsville	House	126	Twenty-second	Second			
Do	do	351	Twenty-third	First			
New Geneva to Morgantown	do	144	Forty-second	Second	1872		412
Upper Monongahela River near Morgantown, W. Va.	do	Ex. 85	do	Third	1873		504
Morgantown to Fairmont	do	Ex. 91	Forty-fourth	First	1876	2	129
Above upper dam (No. 9)					1889	3	1904
Mouth to McKeesport					1899	3	2399
Locks and Dams 1, 3, 4, and 5[1]	House	209	Fifty-eighth	Second	1904	3	2540
TRIBUTARIES.							
Cheat River:							
Preliminary examination					1889	3	1905
Do.[1]	House	248	Fifty-eighth	Second	1904	3	2598
Preliminary examination for a distance of 25 miles up from its mouth.[1]	do	216	Sixtieth	First			
West Fork River: Survey from mouth to the city of Clarksburg.	do	88	Fifty-sixth	do	1900	5	3267
Youghiogheny River:							
Mouth to West Newton					1874	1	558
West Newton to Connellsville.					1876	2	83
McKeesport to Connellsville.	House	Ex. 20	Forty-sixth	Third	1881	3	1957
Do					1884	3	1716
McKeesport to West Newton.	House	82	Fifty-sixth	First	1900	5	3283
Mouth to Connellsville[1]	do	330	Sixtieth	do			
Mouth to West Newton[1]	do	Com. 9	Sixty-first	Second			
Tygarts Valley and Buckhannon Rivers:					1884	3	1718
Deckers Creek:							
For a distance of 1,600 feet above mouth.[1]	House	198	Fifty-ninth	First			
For a distance of 2,000 feet above mouth.[1]	do	57	Sixtieth	do			
For a distance of 2,500 feet above mouth.	do	14	Sixty-second	do			

[1] No maps.

During the year the following work was accomplished: Downstream extension of middle wall at Lock 2 completed, and two lock keepers' houses at Lock 5 completed. The expenditures for the fiscal year ending June 30, 1912, amounted to $9,520.02.

The amount expended up to the end of fiscal year ending June 30, 1912, was $2,206,656.93. Received during the year $56.94 from sale of condemned property.

The condition of work on June 30, 1912, was as follows:

Lock and Dam No. 2.—The lock, power house, guard and guide walls, with the exception of upper 105 feet of upper guide wall, were built under contract. The abutment and dam were built by hired labor. The river lock has been in operation since August 15, 1905, and the landlock since March 5, 1906.

The existence of cross currents at this lock rendered it necessary to extend the upper guide and guard walls upstream and the middle wall downstream to provide safe and convenient access to the locks. These extensions have been made by hired labor and the work is now complete.

Lock and Dam No. 3.—The lock, guard and guide walls, the power house, power plant, and two lock keepers' houses were built under contract. The abutment and dam were built by hired labor, the whole work being complete except for the raising of the upper sill of the river lock. The river lock was placed in operation May 20, 1907, and the land lock October 23, 1907.

Lock and Dam No. 5.—The lock and the guide and guard walls and two lock keepers' houses were built under contract. The power house and lock office on the lock walls, the abutment, and the dam were built by hired labor. The work remaining to be done is to raise the upstream miter sill of the river lock. The river lock was placed in operation in December, 1909, and the landlock on July 29, 1910.

Locks Nos. 3 and 6, and floating plant.—All of the necessary structures at Lock No. 3 and the improvements contemplated at Lock No. 6 have been completed. All of the floating plant provided for in the existing project, consisting of a dredge and two dump scows and repair steamer with snagging appliances, has been completed and put in service. The necessary land has been acquired at Lock No. 6. The abutment of Dam No. 6 has been rebuilt.

The greatest recorded flood height is 44 feet, at Brownsville. Ordinary flood heights average about 30 feet on this portion of the river.

The traffic of the river is still hampered by insufficient capacity and inconvenience at Lock No. 4 and this will not be overcome until the enlargement of this old lock has been accomplished. This is about to be undertaken under an allotment from the indefinite appropriation for operating and care of canals and other works of navigation, on account of the dangerous condition of the present lock. There is also urgent need of enlargement of Lock No. 6, in order to accommodate the large increase in coal traffic from the sixth pool.

A statement of commerce and of the effect of the project on freight rates, so far as known, is given in the report for operating and care of locks and dams on Monongahela River, page 893.

REBUILDING LOCK AND DAM NO. 2.

July 1, 1911, balance unexpended	$17,181.16
June 30, 1912, amount expended during fiscal year, for works of improvement	2,788.06
July 1, 1912, balance unexpended	14,393.10

REBUILDING LOCK AND DAM NO. 3.

July 1, 1911, balance unexpended	$12,882.95
July 1, 1912, balance unexpended	12,882.95
July 1, 1912, outstanding liabilities	112.00
July 1, 1912, balance available	12,770.95

REBUILDING LOCK AND DAM NO. 5.

July 1, 1911, balance unexpended	$13,732.23
Amount received from sales of condemned property	56.94
	13,789.17
June 30, 1912, amount expended during fiscal year, for works of improvement	6,701.96
July 1, 1912, balance unexpended	7,087.21
July 1, 1912, outstanding liabilities	36.40
July 1, 1912, balance available	7,050.81

LOCKS 3, 6, ETC.

July 1, 1911, balance unexpended	$160.46
June 30, 1912, amount expended during fiscal year, for works of improvement	30.00
July 1, 1912, balance unexpended	130.46

LOCKS 5 AND 6.

July 1. 1911, balance unexpended	$2,986.25
July 1, 1912, balance unexpended	2,986.25

CONSOLIDATED.

July 1, 1911, balance unexpended	$46,943.05
Amount received from sales of condemned property	56.94
	46,999.99
June 30, 1912, amount expended during fiscal year, for works of improvement	9,520.02
July 1, 1912, balance unexpended	37,479.97
July 1, 1912, outstanding liabilities	148.40
July 1, 1912, balance available	37,331.57

(See Appendix E E 1.)

2. Operating and care of locks and dams, Monongahela River.—Statements of the original condition of the Monongahela River, W. Va., and Pa., are contained in current summary, page 890, and in report for 1910, pages 685 and 686. The slack-water system of the Monongahela River comprises 15 locks and dams. Locks Nos. 1 to 5, inclusive, are double locks; 6 to 15 are single locks. A table giving the dimensions of the locks, lengths of dams, and other data is given in the Annual Report of the Chief of Engineers for 1907, page 1691.

The dams extend slack water to a point on West Fork River 4 miles above Fairmont, W. Va., or a total distance of about 131 miles above the mouth of the Monongahela River at Pittsburgh. Controlling depths at normal pool stages on the sills at the different old locks below Morgantown vary from 5 to 6 feet at the old locks and from 8 to 8.5 feet at the new locks; at the new locks above that place they are uniformly 7 feet. During low stages of water depths of 8.5 to 11 feet are maintained below Dam No. 6 by placing movable tops or flashboards on the dams.

Locks Nos. 1 to 7, inclusive, have been under operation and care since July 7, 1897, when they were purchased from the Monongahela Navigation Co.; No. 8 since November 8, 1889; No. 9 since 1879; and Nos. 10 to 15, inclusive, since January, 1904.

The amount expended for operating and care up to the close of the fiscal year ending June 30, 1912, is $3,325,127.57, of which $243,481.81 was expended during the year. There were received during the year $443.66; from sales of blue prints, $146.30, and from damages to lock gates, $297.36.

Under the provisions of section 6 of the river and harbor act of March 3, 1909, special allotments amounting to $434,045 have been made from the permanent indefinite appropriation for operating and care of locks and other works of navigation, for the reconstruction of Lock and Dam No. 1, and $290,000 for the reconstruction of Lock and Dam No. 4.

The new outer lock at No. 1 was placed in operation June 6, 1910, and the inner lock June 1, 1912. The power house was completed and the plant installed. Work is in progress on placing concrete top on the old timber crib dam. All the work is done by hired labor. No work has yet been done at No. 4, but this is about to be undertaken.

The amount expended for reconstruction of Lock No. 1 up to the close of the fiscal year ending June 30, 1912, is $402,219.84, of which $57,999.10 was expended during the year.

The total amount expended under these allotments up to the close of the fiscal year ending June 30, 1912, is $3,727,347.41, of which $301,480.91 was expended during the year.

Necessary repairs were made to the locks and dams and floating plant, and the locks were operated throughout the year, except when closed for limited periods for repairs or on account of floods or ice.

The total number of lockages at the 15 locks for the calendar year 1911 aggregated 62,539, giving a total commerce through individual locks amounting to 31,228,975 short tons and 164,049 passengers. Much of this commerce, of course, moved through several locks. Taking only the aggregate of the greatest items of the different kinds of freight passing up and down at any single lock, plus the coal mined and shipped in pools 1 and 2, which amount is manifestly less than the real movement of commerce, the total commerce of the Monogahela River for the year amounted to 10,747,041 short tons and 33,371 passengers.

The effect on freight rates of the slack-water system of the Monongahela is very great. This is particularly true for coal, which is the principal article of commerce, and is well shown by a comparison of the railroad rates for carload lots along this river and those along the unimproved Allegheny. There are many mines along the Monongahela River that can ship either by rail or water, and within a distance of 45 miles from Pittsburgh, which practically covers the industrial district on that river, there is a rate of 10 cents a ton on hauls not exceeding 7 miles. For corresponding distances on the Allegheny the rates average about 35 cents a ton. One large consumer transports coal by river a distance of about 50 miles at a total cost of less than 10 cents a ton, including all charges, while the corresponding railroad freight rate is 45 cents a ton.

(See Appendix E E 2.)

3. Allegheny River, Pa., open-channel work.—The Allegheny River rises in northern Pennsylvania and flows northwestward into New York, and thence in a southerly direction into Pennsylvania to its junction with the Monongahela River at Pittsburgh. Its drainage area is about 11,580 square miles. The average fall per mile of the navigable portion is about 2.2 feet. The minimum discharge at Pittsburgh is about 1,440 cubic feet per second, and the highest measured discharge was 236,834 cubic feet per second on March 15, 1907. In its original condition the Allegheny River abounded in obstructions such as bowlders, snags, islands, bars, and wide-spreading shoals, all of which rendered navigation at best hazardous and practicable only at such stages of water as would enable craft to clear the obstructions.

The present project was adopted by the acts of March 3, 1879, and August 2, 1882, and contemplates the removal of the bowlders and snag obstructions and the construction of low dams and dikes to close secondary channels and concentrate the low-water flow on shoals.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Part.	Page.
Examination of Allegheny River below Freeport and survey of the Allegheny River near Pittsburgh.	....	....	....	....	1876	2	147
Examination of the Allegheny River up to the mouth of French Creek.	House	Ex. 21	Forty-fifth	Third	1879	2	1371
Examination and survey of Allegheny River from French Creek (Franklin, Pa., to Olean, N. Y.).	Senate	Ex. 116	Forty-sixth	Second	1880	2	1767
Preliminary examination for lock and dam on Allegheny River at or near Tarentum Pa.	House	Ex. 37	Fifty-second	do	1893	3	2538
Preliminary examination for lock and dam at most practicable point for navigation on Allegheny River between the dam at Tarentum and Herr Island.	do	Ex. 87	do	do	1893	3	2535
Preliminary examination of Allegheny River from Olean N. Y., to Warren, Pa.	do	Ex. 61	do	do	1893	3	2540
Lock and dam in Allegheny River below Herr Island.	....	....	....	....	1894	3	1921
Survey of Allegheny River, Pa., for lock and dam at or near Tarentum, and lock and dam at the most practicable point for navigation between the proposed dam at Tarentum and Herr Island Dam.	House	204	Fifty-fourth	First	1896	4	2212

References to examination or survey reports and maps or plans not in project documents—Continued.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Part.	Page.
Survey for removal of dam in upper Allegheny River near Corydon, Pa., and of all the dams on the Conewango Creek and the rapids at or near Waterboro in the Conewango Creek.	House	110	Fifty-fifth	Second	1898	3	2211
Survey of Allegheny River, Pa., for extension of slack-water navigation.	do	72	do	Third	1899	3	2411
Preliminary examination of Allegheny River, Pa., with a view to the construction of additional locks and dams.	do	540	Sixty-second	Second			
Survey for removal of dam in upper Allegheny River near Corydon, Pa.	do	110	Fifty-fifth	do	1898	3	2211
TRIBUTARIES.							
Examination of Kiskiminetas and Conemaugh Rivers, Pa.	do	Ex. 105	Forty-fifth	Third	1879	2	1288
Survey of the Clarion River from its mouth to Ridgway, Pa.	Senate	Ex. 18	Forty-seventh	First	1882	3	1936
Preliminary examination of Clarion River.	House	187	Fifty-fourth	do	1896	4	2206
Preliminary examination of Tionesta River (Creek), Pa.	do	Ex. 81	Fifty-third	Third	1895	3	2417
Examination of Red Bank Creek, Pa., from its mouth on the Allegheny River to Brookville.	do	Ex. 86	Forty-sixth	do	1881	3	1959

During the year 136 cubic yards of bowlders, 215 cubic yards of gravel, and 4 snags were removed. The Venango Motor Boat and Canoe Club, of Oil City, Pa., constructed a stone dike for the local improvement of the river in that vicinty.

The total amount expended up to the close of the fiscal year ending June 30, 1912, is $267,211.69, of which $1,133.01 were expended during the year for maintenance. Of this amount it is estimated that about $197,000 were applied to improvement and $70,211.69 to maintenance.

The work that has been done enables navigators to operate safely on stages from 2 to 3 feet lower than formerly.

The channel has been largely cleared of the more objectionable obstructions, but to maintain its condition it is necessary to remove any bowlders or snags brought in by the tributaries or carried along by ice and freshets, and to make occasional repairs to the dikes and dams. The depth at low water on the open river is insufficient for navigation except for short distances in the pools that lie between the shoal places.

The greatest recorded flood height is 36.6 feet at Herr Island Dam. Ordinary flood heights average about 30 feet.

Except on the lower 25 miles of the river, which are slack-watered, the principal traffic is the downstream transportation of timber and lumber rafts, new coal-boat bottoms, barges and flats, usually loaded with tan bark, lumber, posts, railroad ties, and other timber products, and the towage of gravel, stone, sand, etc. Steamboating is not now conducted to any material extent above Kittanning.

The effect of the work on freight rates is not very noticeable, as the depth of water has not been increased, but the hazard of boating has been greatly decreased.

The commerce on open river above slack-water amounted to 346,116 short tons.

The purposes for which the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied are the removal of bowlders and snag obstructions and the repair of existing dams and dikes. The work proposed is necessary to maintain the improvement.

July 1, 1911, balance unexpended	$3,545.84
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,133.01
July 1, 1912, balance unexpended	2,412.83
July 1, 1912, outstanding liabilities	.75
July 1, 1912, balance available	2,412.08
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 2,000.00

(See Appendix E E 3.)

4. *Allegheny River, Pa., construction of locks and dams.*—Prior to the completion, in 1885, of the Davis Island Dam in the Ohio River, 5 miles below its head, it was impossible to navigate the Allegheny River with steam craft of lightest draft during low-water periods, which frequently continued for months at a time. Since then a navigable depth of 8 feet has been afforded by that dam, when raised, to Garrison ripple, 2 miles up the stream.

The original project for lock and dam construction, adopted in 1886 and subsequently extended in 1896, provided for the construction of three locks and dams which have been built and extend slack water from the mouth to Natrona, a distance of 24 miles. The river and harbor act of July 25, 1912, adopted the project printed in House Document No. 540, Sixty-second Congress, second session, for the construction of five additional locks and dams extending slack water upstream to a point about 61 miles from the mouth, at an estimated cost of $2,788,000. The act appropriates $300,000 for this work, contingent upon local interests contributing the same amount.

Dam No. 1 is movable, of Chanoine type, with bear-trap weirs. All other dams are fixed. Dam No. 2 is of concrete on pile foundation and No. 3 is of crib construction. Nos. 4 to 8, inclusive, are designed of same type as No. 2. The available dimensions of Lock No. 1 are 55 feet by 286 feet 2 inches; Nos. 2 and 3, 56 feet by 289 feet 6 inches; Nos. 4 to 8, inclusive, are designed to be 56 feet by 360 feet.

During the year 46,864 cubic yards of material, principally furnace slag and ashes, were deposited in the embankment at abutment of Dam 3.

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[1] Exclusive of the balance unexpended July 1, 1912.

The total amount expended up to the close of the fiscal year ending June 30, 1912, is $1,683,433.82, of which $7,521 was expended during the year for restoration of bank at Dam 3.

The condition of the work on June 30, 1912, was as follows:

Lock and Dam No. 1 (Herr Island), about 1½ miles from the mouth.—This work was built under contract and has been in operation since January 1, 1903.

The dam was first raised June 2, 1903.

Lock and Dam No. 2 (Aspinwall), 7 miles from the mouth.—The lock has been built under contract and has been in operation since November 10, 1906. The abutment and dam have been built under contract, with the exception of a portion of the abutment, which was built by hired labor.

Lock and Dam No. 3 (Springdale), about 17 miles from the mouth.—The lock was built under contract and has been in operation since September, 1904. The abutment and dam were built under contract. In January, 1907, during a moderate flood stage, the abutment failed and a portion of the dam had to be blown up to limit the resulting damage to private property. The abutment and dam have been rebuilt and the bank partly restored by hired labor.

Some dredging will be required in each of the three pools to secure the projected minimum depth of 7 feet.

The greatest recorded flood height is 36.6 feet at Herr Island Dam. Ordinary flood heights average about 30 feet.

A statement of commerce and of the effect of the project on freight rates is given in report on operating and care of locks and dams on Allegheny River.

The purpose for which the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied is the completion of Locks and Dams Nos. 4 and 5, assuming that the total amount to be made available in connection with the present appropriation will be $600,000. It should be noted, however, that there has been no offer or promise of cooperation on the part of local interests, so that there may be no amount whatever available under the terms of the appropriation.

July 1, 1911, balance unexpended	$36,744.51
June 30, 1912, amount expended during fiscal year, for works of improvement	7,521.00
July 1, 1912, balance unexpended	29,223.51
July 1, 1912, outstanding liabilities	573.51
July 1, 1912, balance available	28,650.00
Amount appropriated by river and harbor act approved July 25, 1912	[1]300,000.00
Amount available for fiscal year ending June 30, 1913	328,650.00
July 1, 1912, amount covered by uncompleted contracts	825.00
Amount (estimated) required to be appropriated for completion of existing project	[2][3]2,188,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1][3]600,000.00

(See Appendix E E 4.)

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[1] Contingent upon local interests contributing the same amount.

[2] Exclusive of amount available for fiscal year 1913.

[3] Assuming that local interests will contribute $300,000.

5. Operating and care of locks and dams, Allegheny River, Pa.—Statement of the original condition of the Allegheny River is contained in the preceding summary for Allegheny River, Pa., open-channel work.

The slack-water system of the Allegheny River comprises three locks and dams. Dimensions of locks and other data are given in Annual Report of the Chief of Engineers for 1907, page 1705.

Dam No. 1 is movable and was the first to be completed in the series of three authorized by Congress for the Allegheny River; its pool provides a navigable depth of 5 to 6 feet for a distance of about 5.5 miles. Dams Nos. 2 and 3 are both fixed, the former being built of concrete on pile foundation and the latter of crib construction. Dam No. 2 forms a pool about 10 miles long, while Dam No. 3 extends slack water about 8 miles farther to the projected site of Dam No. 4 at Natrona.

Lock No. 1 has been under operating and care since January 1, 1903; No. 2 since November 10, 1906; and No. 3 since November 29, 1904.

The locks and dams were operated throughout the year as occasion required.

The total amount expended up to the close of the fiscal year ending June 30, 1912, is $369,165.05, of which $34,100.58 were expended during the year. There were received during the year $8.96 from sales of blueprints.

For the calendar year 1911 the commerce reported on that part of the river under the improvement for slack-water navigation was 1,374,626 short tons of freight and 24,374 passengers.

The operation of the locks and dams on the Allegheny River, providing a system of slack-water navigation in connection with Pittsburgh Harbor, will tend to give manufacturing plants in this section the benefit of the cheap river rates on coal and other supplies. These benefits, however, can not be fully realized until the low bridges on the lower Allegheny River are raised sufficiently to remove the very serious obstruction to navigation that they now present. Even under existing conditions one large consumer of coal reports a saving of 25 cents per ton on Monongahela River coal delivered by water as compared with delivery by rail.

(See Appendix E E 5.)

6. Construction of locks and dams in Ohio River above Steubenville, Ohio (65.7 miles).—This portion of the Ohio River in its original condition had a low-water channel depth varying from 1 foot at Pittsburgh to 2 feet at Steubenville, the average slope being about 1.1 feet per mile and the minimum discharge at the head about 1,600 cubic feet per second. The greatest measured discharge at Pittsburgh was 439,565 cubic feet per second on March 15, 1907. Under the original project for open-river improvement, work was conducted on this portion of the river at a number of shoals.

Under the original project for lock and dam construction, adopted in 1875, Dam No. 1 was begun in 1877 and completed in 1885 at a cost of $940,833.31, and the bear-trap weir was begun in 1888 and completed in 1889 at a cost of $32,857.56, making the total cost of completing the lock and dam $973,689.87. Appropriations and allotments were made aggregating $970,034.01, and the sum of $3,655.86 was realized from other sources.

The present project, in its original form, was adopted by Congress September 19, 1890, and, with subsequent modifications, provides for the construction of locks and movable dams Nos. 2 to 10, inclusive, so as to secure a navigable depth of 9 feet in the pools formed thereby, the locks to have available dimensions of 110 by 600 feet, at a total estimated cost for these locks and dams of $10,307,207. This is now a part of the work covered by the general project for locks and dams on the Ohio River, adopted by the act of June 25, 1910. (See H. Doc. No. 492, 60th Cong., 1st sess.) Appropriations aggregating $7,648,221 have been made and the sum of $17,016.65 has been realized from other sources.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Part.	Page.
Preliminary examination of Ohio River at Rochester and Freedom, Pa., for ice breakers.[1]	Senate	Ex. 77	Forty-eighth	First	1884	3	1710
Survey of Ohio River at Rochester and Freedom, Pa., for ice breakers.[1]	do	Ex. 77	do	do	1884	3	1718
Preliminary examination for location of necessary number of dams on Ohio River between Davis Island Dam and dam at or near mouth of Beaver River, Pa.[2]	House	Ex. 45	Fifty-second	Second	1893	3	2523
Survey for location of Dams Nos. 2–5, Ohio River.[1]	do	209	Fifty-fourth	First	1896	4	2130
Preliminary report on survey of Ohio River from Marietta, Ohio, to Pittsburgh, Pa., with view to improvement by movable dams to provide 6 feet at low water.[2]	do	241	Fifty-fifth	Second	1898	3	2157
Final report on survey as above (Marietta Ohio, to Pittsburgh, Pa.)[1]	do	122	do	Third	1899	3	2361
Examination of the river with a view to obtaining channel depths of 6 and 9 feet, respectively.[1]	do	492	Sixtieth	First			

[1] Contain maps. [2] No maps.

The amount expended under present project to the close of the fiscal year ending June 30, 1912, was $7,360,340.11. The amount expended during the fiscal year was $614,830.32.

The condition of work on June 30, 1912, was as follows:

Locks and Dams 2, 3, 4, 5, 6, and 8 were all practically completed, with the exception of some filling and concrete paving on the lock grounds. The dams were first raised on the following dates: No. 1, October 7, 1885; No. 2, November 12, 1906; No. 3, June 25, 1908; No. 4, June 30, 1908; No. 5, November 21, 1907; No. 6, August 17, 1904; No. 8, July 14, 1911.

Lock and Dam No. 7.—The site for this work has been secured. Work was commenced in November, 1910, on construction of lock, dam, and abutment under continuing contract authorization. The lock walls, gate recesses, gate tracks, and 100 linear feet of guide wall have been constructed. A portion of the protection crib of dam has been placed. The balance of contract authorization remaining to be appropriated for this work is $250,000.

Lock and Dam No. 9.—Work on this structure was commenced in November, 1910, under continuing contract authorization. One tract of land has been purchased at the site of this work. The lock walls, gate tracks, and recesses have been practically finished, bearing and sheet piles for both guide walls driven, and part of concrete foundation for upper guide wall placed. Four hundred and eighty-two linear feet of navigable pass adjoining lock have been constructed, and excavation for abutment, Chanoine wicket weir, and one bear-trap gate nearly finished. About 50 per cent of the esplanade fill has been made. The balance of contract authorization remaining to be appropriated for this work is $100,000.

Lock and Dam No. 10.—No work of construction has been undertaken at site of this work on account of insufficient funds. Negotiations have been carried on for acquisition of necessary land. Purchase of one tract has been completed.

The completed dams, Nos. 1–6, inclusive, give continuous slack water, when raised, from Pittsburgh to Merrill, Pa., a distance of about 28.9 miles. Dam No. 8 forms a pool 10 miles long.

The greatest recorded flood height is 34.2 feet at Davis Island Dam. Ordinary flood heights average about 28 feet on this portion of the river.

A statement of commerce and of the effect of the project on freight rates, so far as known, is given in the report for operating and care of locks and dams, Ohio River, page 904.

Lock and Dam No. 7.—The purposes for which the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied are the construction of lock, dam, power house, lock houses, and operating machinery. The additional work proposed is for the purpose of extension of benefits.

Lock and Dam No. 9.—The purposes for which the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied are the construction of lock, dam, power house, lock houses, and operating machinery. The additional work proposed is for the purpose of extension of benefits.

Lock and Dam No. 10.—The purposes for which the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied are the construction of lock and dam. The additional work proposed is for the purpose of extension of benefits.

DAMS NOS. 2–5.

July 1, 1911, balance unexpended	$28,950.10
Amount received from sales of condemned property	24.60
	28,974.70
June 30, 1912, amount expended during fiscal year, for works of improvement	22,654.87
July 1, 1912, balance unexpended	6,319.83
July 1, 1912, outstanding liabilities	1,104.86
July 1, 1912, balance available	5,214.97

DAM NO. 6.

July 1, 1911, balance unexpended	$1,191.74
June 30, 1912, amount expended during fiscal year, for works of improvement	1,191.74

DAM NO. 7.[1]

July 1, 1911, balance unexpended	$429,340.87
Less amount transferred from allotment for Dam 7 to Dam 9, Ohio River	100,000.00
	329,340.87
June 30, 1912, amount expended during fiscal year, for works of improvement	200,392.18
July 1, 1912, balance unexpended	128,948.69
July 1, 1912, outstanding liabilities	17,590.16
July 1, 1912, balance available	111,358.53
Amount allotted from appropriation made by sundry civil act approved Aug. 24, 1912	122,000.00
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	150,000.00
Amount allotted for movable parts, act July 25, 1912	65,000.00
Amount available for fiscal year ending June 30, 1913	448,358.53
July 1, 1912, amount covered by uncompleted contracts	479,534.34
Amount of continuing contract authorization, acts of June 25, 1910, and February 27, 1911	622,000.00
Amount appropriated under such authorization	372,000.00
Amount yet to be appropriated	250,000.00
Amount (estimated) required to be appropriated for completion of existing project	[2] 357,900.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	([3])

DAM NO. 8.

July 1, 1911, balance unexpended	$68,371.71
June 30, 1912, amount expended during fiscal year, for works of improvement	21,982.95
July 1, 1912, balance unexpended	46,388.76

DAM NO. 9.[1]

July 1, 1911, balance unexpended	$351,917.59
Amount received from allotment for Dam No. 7	100,000.00
Amount received from sales of blue prints	14.40
	451,931.99
June 30, 1912, amount expended during fiscal year, for works of improvement	366,787.76
July 1, 1912, balance unexpended	85,144.23
July 1, 1912, outstanding liabilities	58,230.43
July 1, 1912, balance available	26,913.80
Amount allotted from appropriation made by sundry civil act approved Aug. 24, 1912	282,000.00

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[1] The funds derived from the appropriations and continuing-contract authorizations carried by the river and harbor acts of 1910 and subsequent years are apportioned by the Chief of Engineers to the several locks and dams, after recommendation by the Board of Engineers having general supervision over slack-water improvement of the Ohio River.

[2] Exclusive of amount available for fiscal year 1913.

[3] See p. 1278 of this report.

Amount allotted from appropriation made by river and harbor act approved July 25, 1912	$150,000.00
Amount allotted for movable parts, act July 25, 1912	75,000.00
Amount available for fiscal year ending June 30, 1913	533,913.80
July 1, 1912, amount covered by uncompleted contracts	416,387.15
Amount of continuing contract authorization, acts of June 25, 1910, and February 27, 1911	782,000.00
Amount appropriated under such authorization	682,000.00
Amount yet to be appropriated	100,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 43,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	([2])

DAM NO. 10.[3]

July 1, 1911, balance unexpended	$39,916.85
June 30, 1912, amount expended during fiscal year, for work of improvement	1,820.82
July 1, 1912, balance unexpended	38,096.03
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	470,000.00
Amount available for fiscal year ending June 30, 1913	508,096.03
Amount of continuing contract authorization, act of July 25, 1912	500,000.00
Amount yet to be appropriated	500,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 730,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	([2])

CONSOLIDATED.[3]

July 1, 1911, balance unexpended	$919,688.86
Amount received from sales of blue prints	14.40
Amount received from sales of condemned property	24.60
	919,727.86
June 30, 1912, amount expended during fiscal year, for works of improvement	614,830.32
July 1, 1912, balance unexpended	304,897.54
July 1, 1912, outstanding liabilities	76,925.45
July 1, 1912, balance available	227,972.09
Amount allotted from appropriation made by sundry civil act approved August 24, 1912	404,000.00
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	770,000.00
Amount allotted for movable parts, act of July 25, 1912	140,000.00
Amount available for fiscal year ending June 30, 1913	1,541,972.09
July 1, 1912, amount covered by uncompleted contracts	805,921.49

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[1] Exclusive of amount available for fiscal year 1913.

[2] See p. 1278 of this report.

[3] The funds derived from the appropriations and continuing-contract authorizations carried by the river and harbor acts of 1910 and subsequent years are apportioned by the Chief of Engineers to the several locks and dams, after recommendation by the Board of Engineers having general supervision over slack-water improvement of the Ohio River.

Amount of continuing contract authorization, acts of June 25, 1910, March 4, 1911, and July 25, 1912	$1,904,000.00
Amount appropriated under such authorization	1,054,000.00
Amount yet to be appropriated	850,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1]1,130,800.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	(2)

(See Appendix E E 6.)

7. Operating snag boats on Ohio River, in the State of Pennsylvania.—The project adopted July 27, 1905, provides for the removal of snags, wrecks, and similar obstructions in portion of the Ohio River in the State of Pennsylvania. This work was carried on under allotments made from the permanent appropriation for operating snag boats on Ohio River.

The total amount expended on this work to June 30, 1912, was $12,793.93, of which $1,355.35 was expended during the past fiscal year.

There were removed during the year 5 steamboat hulls, 1 coal flat, 2 sunken trees, 10 snags, and a number of large rocks.

(See Appendix E E 7.)

8. Operating and care of locks and dams, Ohio River, above Steubenville, Ohio.—Statement of the original condition of this portion of the Ohio River is found on page 899 of this report.

Locks and Dams Nos. 1 to 6, inclusive, were under the appropriation for operating and care during the whole fiscal year, and No. 8 since July 14, 1911. The dams are all movable. The dimensions of the locks and dams Nos. 1 to 6, inclusive, with other data, are given in Annual Report for 1907, page 1715 et seq.

Dam No. 1, at Davis Island, was designed to give a depth of 6 feet in Pittsburgh Harbor, which has since been increased to 10 feet over certain portions of the harbor by dredging. The other dams are designed to give navigable depths of 9 feet in their respective pools when supplemented by occasional dredging. The aggregate length of the seven pools now in operation on this portion of the river is about 38.7 miles.

These locks and dams were placed under operating and care, as follows: No. 1, October 7, 1885; No. 2, October 13, 1906; No. 3, February 1, 1908; No. 4, February 1, 1908; No. 5, November 21, 1907; No. 6, August 3, 1904; No. 8, July 14, 1911.

The locks and dams were operated as occasion required, and necessary repairs made for maintenance of the works. During the year a contract was entered into for the removal of the two existing steel lock gates and the erection in place of two new steel lock gates at Lock and Dam 1. This work has been completed.

The total amount expended for operating and care to June 30, 1912, was $1,223,542.50. The amount expended during the fiscal year ending June 30, 1912, was $163,241.66.

The traffic for the calendar year 1911, as measured by the commerce through Lock and Dam 1, amounted to 4,105,649 tons of 2,000 pounds, and 56,729 passengers.

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[1] Exclusive of amount available for fiscal year 1913.

[2] See p. 1278 of this report.

Davis Island Dam, forming as it does the pool of Pittsburgh Harbor, has lent its great part to the general effect on freight rates to and from Pittsburgh. The effect on rates of the operation of Dams Nos. 2 to 6, inclusive, should be felt locally for all supplies coming from Pittsburgh Harbor, and to some extent also for through traffic, since they will increase from 25 to 50 per cent the number of days in the year on which tows may be moved down the river from Pittsburgh.

A comparison of the cost of delivery of Monongahela River coal by rail and by river to points in the pools above Dam 6 shows a saving of from 30 to 50 cents a ton in favor of water transportation.

The great future benefit of the above project will be felt only when the slack-water system is extended far enough down the Ohio River to permit continuous navigation during all but the winter season.

(See Appendix E E 8.)

9. *Harbor at Pittsburgh, Pa.*—This harbor comprises that portion of the Ohio River lying above Davis Island Dam, a length of 4.7 miles; that portion of the Allegheny River lying between its mouth and Aspinwall, a length of 7 miles; and that portion of the Monongahela River lying between its mouth and McKeesport, a distance of 15.5 miles; total length of harbor, 27.2 miles. That portion of the harbor most used as such, and called the lower harbor, lies between the Davis Island Dam and Dams No. 1 of the Allegheny and Monongahela Rivers and measures 8 miles of river. In its original condition the lower harbor depths were from 3 to 4 feet at ordinary low water, and still lower stages occurred at times.

Since the completion of Davis Island Dam, in 1885, the maximum draft which could be carried over the shoalest place in the channel was scant 8 feet at pool stage. Parts of the channel and harbor are from 10 to 20 feet in depth. The average widths of the harbor at pool-full surfaces are: On the Ohio, about 1,100 feet; on the Allegheny, about 930 feet; and at different parts of the Monongahela, from 750 to 950 feet. The capacity of the harbor is impaired by shoal places and high dumps projecting from the banks. The use for harbor purposes of that portion of the harbor in the Allegheny River above the Sixth Street Bridge is largely nullified by the low bridges on that part of the stream. The clear heights of these bridges above their respective pool surfaces are from 27½ to 35½ feet. The least height, with chimneys down, of the packets that ply between Pittsburgh and points on the Ohio, Kanawha, and Muskingum Rivers is 45 feet. The average height of the Ohio River towboats with chimneys down, is 44 feet. The height of a suitable packet for the Allegheny River is about 33 feet, and of a suitable towboat, about 28 feet. The result is that practically none of the coal and iron or steel products intended for southern shipments have been loaded or harbored in the Allegheny River. The removal of the Union Bridge at the mouth of the river has opened up this portion of the harbor as far as the Sixth Street Bridge, a distance of about one-half mile.

In 1858 the State of Pennsylvania, through a board of commissioners, made a detailed survey of the rivers at and near Pittsburgh and laid down on the maps high and low water lines intended to define the banks and limit the use of the same by riparian proprietors. These lines were referred to stone monuments on the ground. No means, however, were provided for preserving the monuments nor for preventing the filling in the river beyond these lines.

In 1894 a board of engineer officers recommended certain harbor lines for the harbor of Pittsburgh from the Davis Island Dam to Brilliant, Allegheny River, and to Homestead, Monongahela River. The recommended lines generally followed the actual banks as they existed at that time. These lines were approved by the Secretary of War January 29, 1895. An extension of these lines on the Monongahela River from Homestead to McKeesport was approved by the Secretary of War April 3, 1902.

The original project for improvement was adopted by the river and harbor act of March 3, 1899, based on report printed in Annual Report of the Chief of Engineers for 1899, page 2399, and provided, with subsequent modifications made during the progress of the work, for dredging a channel through the lower harbor (below Dams No. 1 on the Allegheny and Monongahela Rivers) 10 feet deep at pool level and 500 feet wide below Smithfield Street Bridge, Monongahela River, and of less width above this bridge and in the Allegheny River, limited by lines from ends of channel spans of the adjoining bridges, except at the Pan Handle railroad bridge, where the dredged channel, under modified project, was to have a width of 570 feet, including two channel spans; for raising the old riprap dam across Brunot Island back channel, Ohio River; for removing abandoned structures and unauthorized and obstructive fillings projecting from the banks beyond the harbor lines; for marking of harbor lines, and for inspecting and patrolling the harbor. Appropriations aggregating $110,662.90 were made and expended on this work.

The existing project provides for maintenance of the harbor at an annual estimated cost of $5,000. The amount expended under this project to June 30, 1912, was $52,983.68, of which $5,334.19 were expended during the year for maintenance.

Reports of establishments and modifications of harbor lines in Pittsburgh Harbor.

Section covered.	Annual reports of Chief of Engineers.		
	Year.	Part.	Page.
Establishment of harbor lines at Pittsburgh, Pa., and on both sides of the Ohio River as far down as Davis Island Dam	1895	3	2430
Modification of harbor lines in Monongahela River at Pittsburgh, Pa.	1896	4	2315
Modification of harbor lines in Allegheny River at Pittsburgh, Pa.	1896	4	2319
Modification of harbor lines in Ohio River at Allegheny City, Pa.	1899	3	2449
Do	1901	4	2709
Establishment of harbor lines in Monongahela River from Homestead Bridge to McKeesport at mouth of the Youghiogheny River, Pittsburgh Harbor, Pa.	1902	3	1912
Modification of the harbor lines on the right bank of the Monongahela River at Hazelwood, Pittsburgh Harbor, Pa.	1903	2	1708
Modification of harbor lines in Allegheny River at Pittsburgh, Pa.	1903	2	1709
Modification of harbor lines on the left bank of Monongahela River at Dam No. 2, Port Perry, Pa.	1904	3	2553
Modification of harbor lines in Monongahela River at Lock No. 2, Pittsburgh Harbor	1905	2	1869

The greatest recorded flood height is 35.5 feet at Pittsburgh. Ordinary flood heights average about 28 feet.

The principal commercial uses of the harbor are mooring of coal fleets awaiting a rise in the Ohio for proceeding to destination on that river or on the lower Mississippi, the mooring of timber rafts and boat bottoms coming down the Allegheny River on rises, the delivery of coal and other materials to mills, furnaces, steel plants and yards, and the accommodation of the several packet lines plying on the three rivers and whose routes terminate at the harbor. Besides coal, considerable quantities of steel rails, cotton ties, sheet iron, wire, nails, etc., are shipped by barges to the lower river markets.

Commercial statistics.

Calendar years.	Products.	Passengers.	Calendar years.	Products.	Passengers.
	Tons.[1]			*Tons.*[1]	
1900	8,141,451	884,415	1906	12,927,975	271,450
1901	10,916,489	817,800	1907	14,396,816	533,280
1902	12,252,405	996,500	1908	11,454,895	267,043
1903	12,240,360	702,269	1909	12,426,154	699,251
1904	9,878,448	604,477	1910	12,314,664	683,172
1905	12,269,020	603,716	1911	12,519,776	682,807

[1] 2,000 pounds.

The improvement of this harbor is so closely connected with the slack-water system of the rivers emptying into it that it might well be said that, as far as effect on freight rates is concerned, this project is one and the same as the projects for the improvement of said rivers.

The purposes for which the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied are maintenance of harbor, inspection and patrol, making local surveys, and maintenance of harbor line markings. The work proposed is necessary to maintain the improvement.

July 1, 1911, balance unexpended	$5,458.10
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	5,334.19
July 1, 1912, balance unexpended	123.91
July 1, 1912, outstanding liabilities	107.99
July 1, 1912, balance available	15.92
Amount appropriated by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	5,015.92
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

10. Youghiogheny River, Pa.—The Youghiogheny River rises in western Maryland and follows a general northwesterly course to its junction with the Monongahela River at McKeesport, Pa. From its source to Connellsville, 44.4 miles from the mouth, the river has a very steep slope, with narrow valley and frequent gorges. From Connellsville to West Newton, 19.5 miles from the mouth, there is an average fall of about 4.8 feet per mile, and below West Newton the slope is about 1.3 feet per mile. The drainage area is about 1,775 square miles and the minimum measured discharge about 75 cubic feet per second.

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[1] Exclusive of amount available for fiscal year 1913.

In its original condition the river was not navigable except in times of freshet. The construction of Dam 2, Monongahela River, in 1841 gave slack water about 7 miles up the Youghiogheny, and in 1848 a private corporation chartered by the State of Pennsylvania built two locks and dams, extending slack water to West Newton. These works were badly damaged by ice and were finally abandoned in 1865.

The river has been examined several times with a view to improvement by the United States, but no work was authorized prior to 1910.

The existing project, adopted by the river and harbor act of June 25, 1910, provides for the canalization of the river from the mouth to West Newton by the construction of three locks and dams at an estimated cost of $1,050,000, in accordance with plan printed in Rivers and Harbors Committee Document No. 9, Sixty-first Congress, second session.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Part.	Page.
Mouth to West Newton					1874	1	588
West Newton to Connellsville					1876	2	83
McKeesport to Connellsville [1]	House	Ex. 20	Forty-sixth	Third	1881	3	1957
Do.[1]					1884	3	1716
McKeesport to West Newton [2]	House	82	Fifty-sixth	First	1900	5	3383
Mouth to Connellsville [1]	do	330	Sixtieth	do			
Mouth to West Newton [1]	do	Com. 9	Sixty-first	Second			

[1] No maps.

[2] Contains maps.

A survey of the river has been made from its mouth to a point about 20 miles upstream, and plans have been partly prepared for Lock and Dam No. 1. The funds available are insufficient to place the lock under contract.

The total amount expended under the project to June 30, 1912, was $11,760.93, of which $3,107.63 were expended during the year.

The river is navigable for several miles from the mouth by reason of slack water from pool 2, Monongahela River. The length of the river to be improved is about 19.5 miles, having a railroad extending along each bank. The extreme flood height at West Newton is about 31 feet above low water. Several industrial plants on the river near its mouth report a river traffic amounting to about 185,000 short tons in 1911.

July 1, 1911, balance unexpended	$91,346.70
June 30, 1912, amount expended during fiscal year, for works of improvement	3,107.63
July 1, 1912, balance unexpended	88,239.07
July 1, 1912, outstanding liabilities	7.62

July 1, 1912, balance available	$88, 231. 45
Amount (estimated) required to be appropriated for completion of existing project	[1] 950, 000. 00

(See Appendix E E 10.)

EXAMINATION WITH PLAN AND ESTIMATE OF COST OF IMPROVEMENT REQUIRED BY RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Reports dated November 11, 1911, and January 19, 1912, with map, on preliminary examination, with plan and estimate of cost of improvement, respectively, *of Allegheny River, Pa., with a view to the construction of additional locks and dams*, required by the river and harbor act approved February 27, 1911, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 540, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $2,788,000 for first construction, with $25,000 to $60,000 annually for maintenance, is presented.

IMPROVEMENT OF RIVERS AND HARBORS IN THE WHEELING, W. VA., DISTRICT.

This district was in charge of Maj. F. W. Altstaetter, Corps of Engineers, having under his immediate orders Capts. Max C. Tyler, Lewis M. Adams (to Apr. 10, 1912), W. A. Mitchell (since Jan. 15, 1912), and First Lieut. John N. Hodges (since Jan. 16, 1912), Corps of Engineers Division Engineer Lieut. Col. H. C. Newcomer, Corps of Engineers.

1. Locks and dams in Ohio River between Steubenville, Ohio, and the mouth of the Big Sandy River (*Nos. 11 to 28, inclusive*).—A general description of the Ohio River is contained in the Annual Report of the Chief of Engineers for 1896, page 2062. The system of improvement of this river by movable dams was approved by Congress in the act of March 3, 1875 (construction of dam at Davis Island, first dam below Pittsburgh). The act of September 19, 1890, provided for the construction of a dam at or near Beaver, Pa., known as No. 6. The above represent practically the original projects for the slack-water system of the Ohio. The original project for Dams Nos. 7 to 18, inclusive, is contained in Annual Report of the Chief of Engineers for 1899, page 2361, and that for Dams Nos. 19 to 28, inclusive, in Annual Report of the Chief of Engineers for 1902, page 1867.

The river and harbor act approved June 25, 1910, adopted a project for the improvement of the entire Ohio River by the construction of locks and movable dams, with a view to securing a navigable depth of 9 feet, in accordance with report submitted in House Document No. 492, Sixtieth Congress, first session (with maps), and such modification thereof as in the discretion of the Secretary of War may be advisable and with a view to the completion of such improvement within a period of 12 years.

No allotments have as yet been made for the construction of Dams Nos. 16, 17, 21, 22, 23, 24, 25, and 27.

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[1] Exclusive of the balance unexpended July 1, 1912.

The following is a statement of the amounts expended on the dams mentioned to June 30, 1912, none of which was for maintenance:

Dam No. 11	$1,161,596.52	Dam No. 20	$137,410.25
Dam No. 12	111,476.48	Dam No. 26	976,995.91
Dam No. 13	1,210,073.24	Dam No. 28	167,772.64
Dam No. 14	85,383.81		
Dam No. 15	101,476.56		5,174,254.64
Dam No. 18	910,441.77		
Dam No. 19	311,627.46	Received from sales	2,416.42

The following is a statement of the condition of the works:

Dam No. 11.—This lock and dam is practically completed. About 3 per cent of the work under the approved project was accomplished during the current fiscal year.

The structure was placed under the indefinite appropriation for operating and care on August 1, 1911.

Dam No. 12.—This lock and dam is being constructed under a continuing contract, and is 9 per cent completed, 8 per cent of which was accomplished during the current fiscal year.

Two lockkeeper's houses were constructed during the year.

Dam No. 13.—This lock and dam is completed, 1 per cent of which was accomplished during the current fiscal year. The structure was placed under the indefinite appropriation for operating and care on August 1, 1911.

Dam No. 14.—This lock and dam is being constructed under a continuing contract, and is about 8 per cent completed, all of which was accomplished during the current fiscal year.

Two lockkeepers' houses, built by hired labor during the year, were practically 99 per cent completed.

Dam No. 15.—This lock and dam is being constructed under a continuing contract, and is 10 per cent completed, all of which was accomplished during the current fiscal year.

Two lockkeepers' houses have also been constructed.

Dam No. 18.—This work was completed during the fiscal year. It was placed under the indefinite appropriation for operating and care on May 1, 1910.

Dam No. 19.—This lock and dam is being constructed under a continuing contract, and is 25 per cent completed, about 10 per cent of which was accomplished during the current fiscal year.

Two lockkeepers' houses were constructed during the fiscal year.

Dam No. 20.—This lock and dam is being constructed under a continuing contract, and is 11 per cent completed, 10 per cent of which was accomplished during the current fiscal year.

Two lockkeepers' houses were constructed during the fiscal year.

Dam No. 26.—Work at this site has been carried on by hired labor. With the exception of a small amount of dredging and cleaning up the grounds, the work is completed.

Dam No. 28.—This lock and dam is being constructed by hired labor, and is 17 per cent completed, all of which was accomplished during the current fiscal year.

A contract was entered into during the year for two lockkeepers' houses and at the close of the year the houses were about 6 per cent completed.

On account of high water, rain, and exceptionally cold weather, the past season has been an unusually poor one for construction work.

Continuing contracts have been entered into for carrying on the work at Dams Nos. 12, 14, 15, 19, and 20. The balance of the authorization allotted to these particular dams, and remaining to be appropriated for each of the dams, is as follows:

Dam No. 12	$497,000	Dam No. 19	$190,000
Dam No. 14	600,000	Dam No. 20	282,000
Dam No. 15	500,000		

The canalization of this section of the river is not far enough advanced to benefit navigation and, therefore, has had no effect on freight rates.

For commercial statistics, see report of the First Cincinnati District.

The funds estimated to be required for the fiscal year ending June 30, 1914, are to be applied to continuing work on Locks and Dams Nos. 12, 14, 15, 19, 20, and 28.

It appears that there will be a balance remaining after the completion of Locks and Dams Nos. 11, 13, 18, and 26, Ohio River, which works are being constructed under special appropriations. It is recommended that the balances available from these special appropriations, after the completion of the locks and dams, be made available for use under the general project for canalization of the Ohio River.

DAM NO. 11.

July 1, 1911, balance unexpended	$82,766.07
June 30, 1912, amount expended during fiscal year, for works of improvement	37,978.34
July 1, 1912, balance unexpended	44,787.73
July 1, 1912, outstanding liabilities	178.39
July 1, 1912, balance available	44,609.34
July 1, 1912, amount covered by uncompleted contracts	380.00

DAM NO. 12.[1]

July 1, 1911, balance unexpended	$431,724.55
June 30, 1912, amount expended during fiscal year, for works of improvement	93,116.13
July 1, 1912, balance unexpended	338,608.42
July 1, 1912, outstanding liabilities	1,589.43
July 1, 1912, balance available	337.018.99
July 1, 1912, amount covered by uncompleted contracts	837,353.17
Amount of continuing contract authorization, act of June 25, 1910	797,000.00
Amount appropriated under such authorization	300,000.00
Amount yet to be appropriated	497.000.00
Amount (estimated) required to be appropriated for completion of existing projects	[2] 870,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	([3])

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[1] The funds derived from the appropriations and continuing-contract authorizations carried by the river and harbor acts of 1910 and subsequent years are apportioned by the Chief of Engineers to the several locks and dams, after recommendation by the Board of Engineers having general supervision over slack-water improvement of the Ohio River.

[2] Exclusive of balance unexpended July 1, 1912.

[3] See p. 1278 of this report.

DAM NO. 13.

July 1, 1911, balance unexpended	$48,840.51
June 30, 1912, amount expended during fiscal year, for works of improvement	21,082.63
July 1, 1912, balance unexpended	27,757.88
July 1, 1912, outstanding liabilities	125.00
July 1, 1912, balance available	27,632.88

DAM NO. 14.[1]

July 1, 1911, balance unexpended	$328,893.23
Received from sales	11.30
	328,904.53
June 30, 1912, amount expended during fiscal year, for works of improvement	84,247.34
July 1, 1912, balance unexpended	244,657.19
July 1, 1912, outstanding liabilities	1,114.03
July 1, 1912, balance available	243,543.16
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	100,000.00
Amount available for fiscal year ending June 30, 1913	343,543.16
July 1, 1912, amount covered by uncompleted contracts	806,103.74
Amount of continuing contract authorization, act of Feb. 27, 1911	600,000.00
Amount yet to be appropriated	600,000.00
Amount (estimated) required to be appropriated for completion of existing project	[2] 670,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	([3])

DAM NO. 15.[1]

July 1, 1911, balance unexpended	$304,490.52
June 30, 1912, amount expended during fiscal year, for works of improvement	100,930.73
July 1, 1912, balance unexpended	203,559.79
July 1, 1912, outstanding liabilities	1,429.68
July 1, 1912, balance available	202,130.11
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	150,000.00
Amount available for fiscal year ending June 30, 1913	352,130.11
July 1, 1912, amount covered by uncompleted contracts	669,596.65
Amount of continuing contract authorization, act of Feb. 27, 1911	500,000.00
Amount yet to be appropriated	500,000.00
Amount (estimated) required to be appropriated for completion of existing project	[2] 745,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	([3])

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[1] The funds derived from the appropriations and continuing-contract authorizations carried by the river and harbor acts of 1910 and subsequent years are apportioned by the Chief of Engineers to the several locks and dams, after recommendation by the Board of Engineers having general supervision over slack-water improvement of the Ohio River.

[2] Exclusive of amount available for fiscal year 1913.

[3] See p. 1278 of this report.

DAM NO. 18.

July 1, 1911, balance unexpended	$3,924.06
June 30, 1912, amount expended during fiscal year, for works of improvement	937.03
July 1, 1912, balance unexpended	2,987.03
July 1, 1912, outstanding liabilities	1.05
July 1, 1912, balance available	2,985.98

DAM NO. 19.[1]

July 1, 1911, balance unexpended	$533,553.06
Amount received from sales	14.40
	533,567.46
June 30, 1912, amount expended during fiscal year, for works of improvement	99,865.47
July 1, 1912, balance unexpended	433,701.99
July 1, 1912, outstanding liabilities	1,133.10
July 1, 1912, balance available	432,568.89
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	100,000.00
Amount allotted for movable parts, act July 25, 1912	90,000.00
Amount available for fiscal year ending June 30, 1913	622,568.89
July 1, 1912, amount covered by uncompleted contracts	594,308.95
Amount of continuing contract authorization, act of June 25, 1910	490,000.00
Amount appropriated under such authorization	300,000.00
Amount yet to be appropriated	190,000.00
Amount (estimated) required to be appropriated for completion of existing project	[2] 315,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	([3])

DAM NO. 20.[1]

July 1, 1911, balance unexpended	$287,170.11
Amount received from sales	2.25
	287,172.36
June 30, 1912, amount expended during fiscal year, for works of improvement	136,566.56
July 1, 1912, balance unexpended	150,605.80
July 1, 1912, outstanding liabilities	829.74
July 1, 1912, balance available	149,776.06
Amount allotted from appropriation made by sundry civil act approved Aug. 24, 1912	167,000.00
Amount available for fiscal year ending June 30, 1913	316,776.06
July 1, 1912, amount covered by uncompleted contracts	540,359.45

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[1] The funds derived from the appropriations and continuing-contract authorizations carried by the river and harbor acts of 1910 and subsequent years are apportioned by the Chief of Engineers to the several locks and dams, after recommendation by the Board of Engineers having general supervision over the slack-water improvement of the Ohio River.

[2] Exclusive of amount available for fiscal year 1913.

[3] See p. 1278 of this report.

Amount of continuing contract authorization, act of Feb. 27, 1911	$449,000.00
Amount appropriated under such authorization	167,000.00
Amount yet to be appropriated	282,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 825,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	([2])

DAM NO. 26.

July 1, 1911, balance unexpended	$516,879.20
Amount received from sales	165.75
	517,044.95
June 30, 1912, amount expended during fiscal year, for works of improvement	293,732.51
July 1, 1912, balance unexpended	223,312.44
July 1, 1912, outstanding liabilities	1,071.29
July 1, 1912, balance available	222,241.15
July 1, 1912, amount covered by uncompleted contracts	47,481.40

DAM NO. 28.[3]

July 1, 1911, balance unexpended	$249,798.03
Amount received from sales	77.15
	249,875.18
June 30, 1912, amount expended during fiscal year, for works of improvement	167,570.67
July 1, 1912, balance unexpended	82.304.51
July 1, 1912, outstanding liabilities	15,453.01
July 1, 1912, balance available	66,851.50
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	300,000.00
Amount available for fiscal year ending June 30, 1913	366,851.50
July 1, 1912, amount covered by uncompleted contracts	54.068.71
Amount (estimated) required to be appropriated for completion of existing project	[1] 479,336.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	([2])

CONSOLIDATED.

July 1, 1911, balance unexpended	$2,788,039.34
Amount received from sales	270.85
	2,788,310.19
June 30, 1912, amount expended during fiscal year, for works of improvement	1,036,027.41
July 1, 1912, balance unexpended	1,752,282.78
July 1, 1912, outstanding liabilities	22,924.72

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[1] Exclusive of amount available for fiscal year 1913.

[2] See p. 1278 of this report.

[3] The funds derived from the appropriations and continuing-contract authorizations carried by the river and harbor acts of 1910 and subsequent years are apportioned by the Chief of Engineers to the several locks and dams, after recommendation by the board of Engineers having general supervision over the slack-water improvement of the Ohio River

July 1, 1912, balance available		$1,729,358.06
Amount allotted from appropriation made by sundry civil act approved Aug. 24, 1912		167,000.00
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		650,000.00
Amount allotted for movable parts, act July 25, 1912		90,000.00
Amount available for fiscal year ending June 30, 1913		3,549,672.07
July 1, 1912, amount covered by uncompleted contracts		1,440,159.67
Amount of continuing-contract authorizations:		
Act of June 25, 1910	$1,287,000	
Act of Feb. 27, 1911	1,549,000	
		2,836,000.00
Amount appropriated under such authorization, act of June 25, 1910, and Aug. 24, 1912		767,000.00
Amount yet to be appropriated:		
Act of June 25, 1910	$520,000	
Act of Feb. 27, 1911	1,549,000	
		2,069,000.00
Amount (estimated) required to be appropriated for completion of existing project		[1]3,904,336.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		(2)

(See Appendix F F 1.)

2. *Operating and care of Locks and Dams Nos. 11, 13, and 18, Ohio River.*—A general description of the Ohio River is contained in the Annual Report of the Chief of Engineers for 1896, page 2062. The dams are all movable and were built under appropriations for improving Ohio River.

The locks were placed under operating and care on the following dates: Dams Nos. 11 and 13, August 1, 1911; Dam No. 18, May 1, 1910.

The total amount expended for operating and care of these dams to June 30, 1912, is $50,141.68, of which $36,231.11 was expended during the fiscal year 1912.

The locks and dams were operated as occasion required, and necessary repairs were made for the maintenance of the works.

(See Appendix F F 2.)

3. *Little Kanawha River, W. Va.*—This river lies entirely within the State of West Virginia. It rises on the western slope of Laurel Hill, flows across Braxton, Gilmer, Calhoun, Wirt, and Wood Counties, and empties into the Ohio River at Parkersburg, W. Va. Its general course is northwest, and it is very crooked and full of sharp turns, this being especially true in Calhoun and Wirt Counties. The river is about 158 miles long.

The original project, adopted by act approved August 14, 1876, provided for removing rocks, snags, and overhanging and fallen trees above Burning Springs, W. Va., at a cost of $7,300. This project was modified by act of June 14, 1880, which provided for the construction of a lock and dam 2 miles above Burning Springs. This lock was opened to navigation on December 2, 1891, and has since been maintained under the indefinite appropriation for operating and care of canals and other works of navigation.

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[1] Exclusive of amount available for fiscal year 1913.

[2] See p. 1278 of this report.

The present project was adopted by the act of March 3, 1905, which provided for the purchase and repair of Locks and Dams Nos. 1 to 4, owned by the Little Kanawha Navigation Co. The project is printed in House Document 309, Fifty-eighth Congress, second session.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Below Bulltown [1]	House	75	Forty-fourth	First	1875	740
Entire river [1]	do	98	Fifty-third	Third	1896	2329
Lock No. 5 to Burnsville [1]	do	217	Fifty-eighth	Second	1904	2597
Estimate of cost of purchase and repair of Locks Nos. 1-4, not owned by the Government.[1]	do	309	do	do	1904	2607
For one lock and dam above Lock No. 5.	do	917	Sixtieth	First		
Entire river [2]	do	480	Sixty-second	Second		

[1] No maps.

[2] Contains maps.

The mill dam at Stouts Mill has been purchased and the dam removed, which has benefited navigation.

During the year a lockkeeper's house and two outbuildings were constructed by contract at Lock No. 3. A pair of upper gates for Lock No. 1 were built, but not hung, and extensive repairs were made to Lock and Dam No. 5.

The amount expended to June 30, 1912, is $492,249.58, of which $8,411.14 was applied to maintenance, $75,000 to acquisition, $189,580 to repair of locks and dams Nos. 1 to 4, and $500 to survey above Lock No. 5. The sum of $2,245.60 was received from sales.

The maximum draft which can be carried at mean low water over the shoalest place in that section of the river under maintenance of improvement is hardly 6 inches. During small rises steamboats run to Grantsville, 76 miles from the mouth. The head of gasoline-boat and push-boat navigation is Burnsville, 121 miles from the mouth; rafting, however, extends some miles above.

Slack-water navigation extends from the mouth of the river to Creston, W. Va., a distance of 48 miles, and provides a depth of 4 feet.

Between Creston and Burnsville the high-water mark ranges from 30 feet at Creston to 22.1 feet at Burnsville. During very dry seasons there are only a few inches of water on the shoals. The highest stage reached at Lock No. 5 during the year was 25 feet above low water, or 9 feet above the crest of the dam.

A statement of the commerce is contained in the report for operating and care of locks and dams on Little Kanawha River, W. Va.

During the past year one steamboat has been making daily trips between Parkersburg and Creston, and one gasoline boat has been making triweekly trips between the same points. One gasoline boat makes daily trips between Elizabeth and Parkersburg, and about six gasoline boats running periodically between Parkersburg and Grantsville when the water will permit. There is also one gasoline boat making daily trips between Palestine Transfer and Creston, and two running regularly (when water will permit) between Palestine Transfer and Grantsville. When rises are 3 feet or more, several of these boats make trips between Grantsville, Glenville, and Stouts Mill.

It is believed that this improvement has tended to lower the freight rates.

ABOVE LOCK NO. 5.

July 1, 1911, balance unexpended	$1,353.74
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,353.74

PURCHASE AND REPAIR OF LOCKS NOS. 1 TO 4.

July 1, 1911, balance unexpended	$5,277.10
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	5,277.10

BETTERMENTS, LOCKS NOS. 1 TO 4.

July 1, 1911, balance unexpended	$30,317.60
Amount received from sale of steamer *Loma*	2,000.00
	32,317.60
June 30, 1912, amount expended during fiscal year, for works of improvement	27,903.58
July 1, 1912, balance unexpended	4,414.02
July 1, 1912, outstanding liabilities	194.70
July 1, 1912, balance available	4,219.32
July 1, 1912, amount covered by uncompleted contracts	2,500.00

CONSOLIDATED.

July 1, 1911, balance unexpended		$36,948.44
Amount received from sale of steamer *Loma*		2,000.00
		38,948.44
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$27,903.58	
For maintenance of improvement	6,630.84	
		34,534.42
July 1, 1912, balance unexpended		4,414.02
July 1, 1912, outstanding liabilities		194.70
July 1, 1912, balance available		4,219.32
July 1, 1912, amount covered by uncompleted contracts		2,500.00

(See Appendix F F 3.)

4. Operating and care of locks and dams on Little Kanawha River, W. Va.—The lock and dam known as No. 5 was built under the appropriation for improving the Little Kanawha River, W. Va., being a part of the original project as given in the Annual Report of the Chief of Engineers for 1875, page 740.

Locks and Dams Nos. 1 to 4 were purchased from the Little Kanawha Navigation Co. and transferred to the Government on November 1, 1905.

The five locks and dams provide slack-water navigation for a distance of 48 miles from the mouth, and are being operated under the permanent appropriation provided by section 4 of the act approved July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909.

The total amount expended in operating and care of these works to June 30, 1912, is $101,523.86, of which $9,778.38 was expended during the past fiscal year.

A table of the important features, giving location, year when finished, etc., of the locks and dams is contained in the Annual Report of the Chief of Engineers for 1903, page 1720.

Ice interfered with navigation about 30 days.

Minor repairs were made at the various locks and dams during the year.

The commerce for the calendar year 1911 amounted to 120,244 short tons, and was valued at $4,122,024. Of the foregoing there were 97,648 tons of timber products (saw logs, ties, etc.).

(See Appendix F F 4.)

5. *Kanawha River, W. Va.*—This river extends for a distance of 94½ miles from Kanawha Falls to Point Pleasant, W. Va., where it empties into the Ohio.

The original project, adopted in 1873, provided for the removal of rocks, snags, etc.

The present project was adopted by the act approved March 3, 1875, is printed in the Annual Report of the Chief of Engineers for 1875, part 2, pages 90–98, and contains maps.

Ten locks and dams have been built under the revised project, which extend slack water to Loup Creek Shoal, about 90 miles from the mouth, leaving 4½ miles of the upper river unimproved.

A description of the condition of the river, the projects, and the general work accomplished (the locks and dams being in operation) are contained in the Annual Report of the Chief of Engineers for 1900, page 490.

The amount expended under the original project is $50,000; that expended under the present project to June 30, 1912, is $4,233,634.40 ($3,429.68 was received from sales, etc.).

The maximum draft that can be carried at the shoalest part of the slack-water system at mean low water is 6 feet.

For commercial statistics see report for operating and care of locks and dams on Kanawha River, W. Va.

The improvement of this river having been gradual, it is difficult to give the exact effect the improvement has had upon freight rates. There is no doubt, however, that freight rates, where transportation by the Kanawha River is available, are regulated thereby.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entire river	Senate	25	Forty-second	Third		
Photos of Lock and Dam No. 11					1896	2269
Photos of Locks and Dams Nos. 9, 10, and 11.					1898	2129
Lock and Dam No. 11 [1]					1899	2484
Lock No. 2 to the Falls [2]	House	805	Fifty-eighth	Second	1904	2587

[1] Contains maps. [2] No maps.

July 1, 1911, balance unexpended	$43, 712. 58
Amount received from sales	366. 82
	44, 079. 40
June 30, 1912, amount expended during fiscal year, for works of improvement	28, 420. 98
July 1, 1912, balance unexpended	15, 658. 42
July 1, 1912, outstanding liabilities	49. 90
July 1, 1912, balance available	15, 608. 52
July 1, 1912, amount covered by uncompleted contracts	9, 989. 94

(See Appendix F F 5.)

6. *Operating and care of locks and dams on Kanawha River, W. Va.*—Under the projects for improving the Kanawha River 10 locks and dams were built, 2 fixed dams and 8 movable (Chanoine type), extending slack-water navigation for a distance of 90 miles from the Ohio River. The maintenance of these works is provided for by the indefinite appropriation for operating and care of canals and other works of navigation, made by section 4 of the act approved July 5, 1884, as amended and reenacted by section 6 of the river and harbor act approved March 3, 1909.

The location of each lock and dam and the year in which they were completed are given in the Annual Report of the Chief of Engineers for 1899, page 428.

A table of important features, giving available lengths and widths of locks, lengths of passes, etc., is contained in the Annual Report of the Chief of Engineers for 1903, page 1724.

The total amount expended in operation and care of these works to June 30, 1912, is $1,264,697.58, of which $119,180.75 was expended during the past year.

The U. S. dredge *Addison* and the snag boat *Captain Turtle* were engaged in clearing the channel of obstructions during the year and repairs were made at the various locks and dams.

Part of the system of improvement having been completed in 1880, the repairs required each year are increasing.

The commerce for the calendar year 1911 amounted to 1,392,788 short tons, with a valuation of $4,512,758.29. Of the foregoing there were 1,346,140 tons of coal and 21,506 tons of timber products, valued at $1,177,872.50 and $151,292.98, respectively.

(See Appendix F F 6.)

EXAMINATION AND SURVEY OF LITTLE KANAWHA RIVER, W. VA., MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

Reports dated June 8, 1909, and January 31, 1910, with maps, on preliminary examination and survey, respectively, *of Little Kanawha River, W. Va., with a view to the modification of the existing system of locks and dams and its further improvement*, together with a supplemental survey report dated May 23, 1911, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors pursuant to law and were transmitted to Congress and printed in House Document No. 480, Sixty-second Congress, second session. A modification of the existing system of locks and dams and the further improvement of this stream as contemplated by the act is not deemed worthy of being undertaken by the General Government at the present time.

IMPROVEMENT OF RIVERS AND HARBORS IN THE SECOND CINCINNATI, OHIO, DISTRICT.

This district was in the charge of Maj. John C. Oakes, Corps of Engineers. Division Engineer, Lieut. Col. H. C. Newcomer, Corps of Engineers.

1. Muskingum River, Ohio.—The original condition of the waterway and its availability for purposes of commerce are given in the Annual Report of the Chief of Engineers for 1900, part 1, page 488. For more extended information reference is also made to the Annual Report of the Chief of Engineers for 1904, part 1, page 477.

This river is formed 107 miles from the Ohio River by the junction of the Tuscarawas and Walhounding Rivers, and flows in a southeasterly direction, emptying into the Ohio at Marietta, Ohio.

The original project, adopted August 11, 1888, provided for the construction of a lock at Dam No. 9, Taylorsville, Ohio, and the reconstruction of Lock No. 10, Zanesville, Ohio, 67 and 76 miles, respectively, from the mouth of the river. The repair and extension of the levee above Dam No. 10, Zanesville, Ohio, was added by the act of July 1, 1898. Raising the crest of Dam No. 9 and building four lock houses was added by the act of June 13, 1902.

With the exception of the reconstruction of a lock at Zanesville (which was indefinitely postponed and the money originally appropriated for it diverted to other purposes) all of this work has been completed.

The amount expended prior to operations under existing project was $135,266.40.

The existing project, adopted March 3, 1905, provides for the raising of the crest of Dam No. 3 and building a lockmaster's dwelling at Lock No. 10, at an estimated cost of $8,000; and rebuilding Lock and Dam No. 11, at an estimated cost of $110,000. An additional sum of $48,000 was appropriated by act of March 2, 1907, for the completion of this lock and dam. All of this work has been completed, with the exception of a few minor details necessary to complete Lock and Dam No. 11.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Lock and Dam No. 11 [1]					1895	2890
Do.[2]	House	241	Fifty-eighth	Second	1904	2654

[1] Contains maps.

[2] No maps.

No modification has been made in the existing project since its adoption.

Operations during the year.—At Lock No. 11 protected 120 linear feet of caving bank below the lock with 4,450 square feet of wire-woven willow mattress covered with riprap; partially completed gravel walks on lock grounds.

The amount expended under existing project up to the close of the fiscal year ending June 30, 1912, was $164,195.21, not including $581.74 which was expended out of an appropriation of $3,000 included in the deficiency act, approved June 25, 1910, for repair to break in levee at Dam No. 10.

The miter-sill depth at pool level is the controlling mean low-water depth of the system; this is 6 feet at Locks Nos. 1 to 10, and 7½ feet and 9 feet, respectively, for the lower and upper sills at Lock No. 11.

The usual variation in the level of water surface is 38 feet at Lock No. 1 and 24 feet at Lock No. 11.

The present head of slack-water navigation is 91 miles above the mouth of the river. At ordinary high stages the stream is navigable for light-draft boats to Coshocton, Ohio, 107 miles above its mouth at Marietta, Ohio.

The commercial statistics are reported under the head of operating and care of locks and dams on Muskingum River (see below).

It is believed that this improvement has had no material effect on freight rates.

As the project is practically completed, no estimate for further appropriation is submitted.

July 1, 1911, balance unexpended	$5,932.69
June 30, 1912, amount expended during fiscal year, for works of improvement	355.22
July 1, 1912, balance unexpended	5,577.47

REPAIR OF LEVEE AT DAM NO. 10, MUSKINGUM RIVER, AT ZANESVILLE, OHIO.

Amount appropriated by deficiency act approved June 25, 1910	$3,000.00
Amount previously expended	581.74
July 1, 1912, balance unexpended	2,418.26

(See Appendix G G 1.)

2. Operating and care of locks and dams on Muskingum River, Ohio.—The original condition and scope of this improvement is described in the Annual Reports of the Chief of Engineers for 1887, part 3, page 1815, and 1901, part 1, page 485. For more extended information reference is also made to the Annual Report of the Chief of Engineers for 1904, part 1, page 478.

Under allotments from the indefinite appropriation for operating and care of canals and other works of navigation there has been expended up to June 30, 1912, a total sum of $1,948,440.99 and an additional sum of $17,190.44 in building a protection wall at Zanesville and altering certain bridges at Taylorsville and Marietta, Ohio.

The amount expended during the year ending June 30, 1912, was $72,778.20.

The principal work has been the maintenance of channels by dredging and the repair of locks, dams, and their appurtenances, including buildings and grounds, and floating plant. The details are given in the report of the local officer, Appendix G G 2.

The total commerce for the fiscal year ending June 30, 1912, which consisted principally of miscellaneous merchandise, was approximately 72,145 short tons, valued at $3,426,236.

It is believed that the improvement has had no material effect on the nature of the commerce.

(See Appendix G G 2.)

3. Big Sandy River and Levisa and Tug Forks, W. Va., and Ky.—For more extended information concerning the early history of this improvement, reference is made to the following Annual Reports of the Chief of Engineers: For the year 1875, pages 756–769; for the year 1904, part 1, page 479; and for the year 1905, part 1, pages 488–489.

The Big Sandy River is formed at Louisa, Ky., 27 miles from the Ohio River, by the junction of the Levisa and Tug Forks, and flows in a northwesterly direction, emptying into the Ohio at Catlettsburg, Ky. The Levisa Fork, the larger of the two streams that unite to form the Big Sandy River, rises in the southwestern part of Virginia and flows in a northwesterly direction. The Tug Fork rises in the mountains of McDowell County, W. Va., and flows in a northwesterly direction. The distance from Louisa to Pikeville, the head of proposed slack-water improvement on Levisa Fork, is 86.5 miles, and from Louisa to mouth of Pond Creek, the head of proposed slack-water improvement on Tug Fork, is 23.5 miles.

The original project was adopted July 18, 1878, and provided for the removal of rocks, snags, and overhanging trees from the Big Sandy River and its forks. The construction of a lock and fixed dam below the junction of the two forks and near Louisa, Ky., was added by the act of June 14, 1880, and in 1891 was modified to admit of the construction of a movable instead of a fixed dam.

The work of clearing the forks of obstructions is carried on from year to year as funds are made available.

The amount expended on original and modified projects prior to operations under existing project, exclusive of maintenance on Levisa and Tug Forks, was $380,431.16.

The existing project, adopted March 3, 1899. contemplates carrying slack water from the Ohio River to Pikeville, on Levisa Fork, and to the mouth of Pond Creek, on Tug Fork, by the construction of 21 locks and dams, at an estimated cost of $4,725,000. Of these locks and dams 10 are proposed for the Levisa Fork, 8 for Tug Fork, and 3 for the main river. The survey on which this improvement was based developed the fact that only two additional locks and dams would be required for the main river, besides the one at Louisa already completed.

The raising of the crest of Dam No. 3, at Louisa, Ky., was added by the act of June 13, 1902, at an estimated cost of $35,000.

The improvement at the mouth of the Big Sandy River by the construction of regulating works was added by the act of March 3, 1905, at a cost of $40,000.

The construction of a steel service bridge at Lock No. 1, Big Sandy River, was added by the act of March 2, 1907, at a cost of $7,000, and an additional appropriation of $3,000 was made by the river and harbor act of June 25, 1910.

All work of this project applicable to the main river, Catlettsburg to Louisa, has been completed, with the exception of the steel service bridge at Lock No. 1, which was placed under contract December 1, 1910.

Lock and Dam No. 1, Levisa Fork, have been completed with the exception of a small quantity of pile and riprap protection at abutment.

Lock and Dam No. 1, Tug Fork, have been completed with the exception of the protection of the foundations of guard and guide walls and abutment with sheet piles.

Surveys and borings have been made for the sites of Lock and Dam No. 2, Levisa Fork, and Lock and Dam No. 2, Tug Fork, and negotiations for the necessary land have been started. The amount of money available is insufficient to start the work with any degree of economy, and it is therefore considered advisable that no action be taken toward the construction of these works until the survey of the Tug and Levisa Forks, provided for in the river and harbor act approved July 25, 1912, has been made.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Big Sandy River, and Tug and Levisa Forks of same.	--------	--------	--------	--------	1875 [1]	756
	--------	--------	--------	--------	1889 [1]	1990
	House	[1] 456	Fifty-fifth	Second	1898	2159
	do	[1] 326	Fifty-sixth	First	1900	3400
	do	[2] 235	do	Second	1901	2750

[1] No maps.

[2] Contains maps.

No modification has been made in the existing project since its adoption.

The amount expended on existing project up to the close of the fiscal year ending June 30, 1912, was as follows:

Big Sandy River, including Tug and Levisa Forks, general improvement	$1,148,637.60
Big Sandy River, maintenance	1,381.19
Levisa Fork, maintenance	32,192.41
Tug Fork, maintenance	31,284.06

The completed locks, three on the main river and Lock No. 1, Levisa Fork, and Lock No. 1, Tug Fork, provide a minimum depth of 6 feet on their sills, except at Lock No. 1, main river, at Catlettsburg, Ky., where the depth on the pass sill depends upon the stage of the Ohio River, which is uncertain and will remain so until Dam No. 29 in the Ohio River, immediately below Catlettsburg, is completed.

The minimum draft that can be carried over the shoalest portions of the forks at mean low water is uncertain and changeable, and can not be definitely stated, owing to the constant movement of the bottom and the fact that the obstructions naturally renew themselves.

The Big Sandy River is navigable by steamer from Catlettsburg, the mouth of the river, up to Louisa, Ky., a distance of 27 miles, and from there up Levisa Fork a distance of 18 miles, and up Tug Fork a distance of 12 miles. For pole boats, rafts, etc., the head of present navigation is taken at Pond Creek on Tug Fork and at Pikeville on Levisa Fork.

It is believed that the work thus far accomplished on this improvement has had no material effect on freight rates.

The river and harbor act, approved July 25, 1912, authorized a further examination of Tug and Levisa Forks of Big Sandy River. Pending the submission of a report on this examination no estimate for continuing the work of lock and dam construction is submitted.

Reference to report on examination made in compliance with act of March 2, 1907, will be found on page 612, Annual Report of the Chief of Engineers for 1908.

Commercial statistics are reported under the head of operating and care of locks and dams on Big Sandy River, W. Va. and Ky.

July 1, 1911, balance unexpended	$118,637.93
Received from sales	.50
	118,638.43
June 30, 1912, amount expended during fiscal year, for works of improvement	10,864.38
July 1, 1912, balance unexpended	107,774.05
July 1, 1912, outstanding liabilities	487.46
July 1, 1912, balance available	107,286.59
July 1, 1912, amount covered by uncompleted contracts	7,509.86
Amount (estimated) required to be appropriated for completion of existing project	[1] 3,555,000.00

(See Appendix G G 3.)

4. *Operating and care of locks and dams on the Big Sandy River, W. Va. and Ky., and Tug and Levisa Forks of same.*—For more extended information reference is made to the following Annual Reports of the Chief of Engineers: For year 1904, part 1, page 481, and for the year 1905, part 1, page 490.

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[1] Exclusive of the balance unexpended July 1, 1912.

Under allotments from the indefinite appropriation for operating and care of canals and other works of navigation there has been expended up to June 30, 1912, a total sum of $204,664.47.

The amount expended during the year ending June 30, 1912, was $46,120.81.

The principal work has been clearing the channels and lock approaches of snags and other obstructions and the repair of locks, dams, and their appurtenances, including buildings and grounds, and floating plant. The details are given in the report of the local officer, Appendix G G 4.

The total commerce for the fiscal year ending June 30, 1912, which consisted principally of timber, ties, manufactured iron, and miscellaneous merchandise was approximately 181,770 short tons, valued at $1,436,375.

It is believed that the improvement has had no effect on the nature of the commerce.

(See Appendix G G 4.)

5. *Kentucky River, Ky.*—The original condition of the waterway and its availability for purposes of commerce are given in the Annual Report of the Chief of Engineers for 1879, part 2, pages 1398–1422. For more extended information reference is made to the Annual Report of the Chief of Engineers for 1906, part 1, pages 541–542.

This river is formed 258 miles from the Ohio River by the junction of the North, South, and Middle Forks, flows in a northwesterly direction and empties into the Ohio at Carrollton, Ky.

The original project, adopted March 3, 1879, provides for the repair and rebuilding of the five old locks and dams originally constructed by the State of Kentucky, and constructing 12 additional locks and dams, extending slack-water navigation from the mouth of the river to the three forks, a distance of about 261 miles, at an estimated cost of $1,074,402.

In 1883 the above estimate was increased to $2,471,639. (See Annual Report of the Chief of Engineers for 1883, pp. 1561–1562.)

In 1899 the above project and estimate were modified to provide for the construction of seven locks and dams of 18-foot lift between Lock No. 7 and Beattyville, Ky., at an estimated cost, including past work, of $4,865,550. (See Annual Report of the Chief of Engineers for 1899, p. 2513.)

The original project, with modifications, now provides for the repair and rebuilding of the five old locks and dams acquired from the State of Kentucky and the construction of nine additional locks and dams, at a total estimated cost of $4,865,550.

References to examination and survey reports and maps and plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Kentucky River and Three Forks [1]	....	....	....	....	1879 1899	1398 2513

[1] No maps.

OPERATIONS DURING THE YEAR.

At Lock and Dam No. 13, completed, under contract, the construction, in concrete, of the lock; about 5 per cent of this work was accomplished during the year. Of the quantities required in the contract for the construction, in concrete, of the dam the following was accomplished during the year: Excavation, 43.25 per cent; concrete, 39.22 per cent; and embankment in rear of finished walls, 41.23 per cent. At Lock and Dam No. 14, completed, under contract, the construction of three dwellings, three outbuildings, three cisterns, and necessary drains. The work accomplished during the year under contract for the construction of the lock and dam amounted to approximately 54 per cent of the total amount of excavation and 6.5 per cent of the total amount of concrete required under the contract.

The total amount expended under existing project up to the close of the fiscal year ending June 30, 1912, was $3,724,912.14.

The works in progress are carried on under a continuing-contract authorization contained in the river and harbor act of February 27, 1911. The balance of the authorization remaining to be appropriated is $82,650.

With the exception of Dam No. 13 and Lock and Dam No. 14, which are now under construction, the approved project has been completed.

Certain bridges and public roadways crossing the small streams that enter into this river have been more or less damaged by reason of this improvement. The communities in which these damages have occurred are no doubt entitled to some relief, but it is believed that the entire cost of providing suitable bridges or relocating roadways should not be borne by the United States.

The river and harbor act approved July 25, 1912, amended the provision in the river and harbor act of June 25, 1910, which provided that of the amount appropriated thereby "the sum of $6,000 may be expended for the construction of a bridge across Tates Creek and the restoration of the county road near Otter Creek," so as to authorize the Secretary of War to use so much of said sum as may be necessary (not exceeding $1,500) for reimbursing the county of Madison, Ky., the moneys expended by it in restoration of the county road near Otter Creek.

The greatest draft which can be carried at mean low water from Lock No. 1 to the head of slack-water navigation (a distance of 239.5 miles) is 5.5 feet; above this point no boats can run at a low stage.

The usual variations of level of water surface are from 23 to 40 feet, and occasionally much more.

Ordinary low-water depth through Lock No. 1 and to the Ohio River, 4 miles below, is 6 feet or more, but at extreme low water in the Ohio only about 2½ feet can be carried over the lower sill of Lock No. 1. With the dam across the Ohio River at Louisville raised there will be a depth of full 6 feet on this sill at all stages.

The old locks, Nos. 1 to 5, inclusive, built by the State, have 145 feet available length and 38 feet width. The new locks, from No. 6 up, have available lengths of from 146 to 148 feet, and are 52 feet in width.

The principal commerce of the river is timber, much of it loose logs, and the improvement is rather detrimental to this than otherwise. The logs are damaged in passing the dams, and in their turn cause much damage to the works; they are also a prolific source of snags and of discouragement to any steamboat traffic that might develop.

Commercial statistics are given in the report for operating and care of locks and dams on Kentucky River.

There are not likely to be any decided changes in the volume or character of the commerce benefited until the improvement is carried to the head of the river, where it is hoped that coal lands may be developed and the product shipped by river. It is believed that the project has so far had no material effect on freight rates.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to the construction of Dam No. 13 and Lock and Dam No. 14.

July 1, 1911, balance unexpended	$367,869.59
Received from sales	.25
	367,869.84
June 30, 1912, amount expended during fiscal year, for works of improvement	138,382.03
July 1, 1912, balance unexpended	229,487.81
July 1, 1912, outstanding liabilities	1,021.75
July 1, 1912, balance available	228,466.06
Amount appropriated by sundry civil act approved Aug. 24, 1912	168,000.00
Amount available for fiscal year ending June 30, 1913	396,466.06
July 1, 1912, amount covered by uncompleted contracts	390,064.30
Amount of continuing contract authorization, act of Feb. 27, 1911	250,650.00
Amount appropriated under such authorization	168,000.00
Amount yet to be appropriated	82,650.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 222,650.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 82,650.00

(See Appendix G G 5.)

6. Operating and care of locks and dams on Kentucky River, Ky.—At the time the United States acquired possession of the five locks and dams on this stream, in 1880, navigation, then extending for a distance of 87 miles upstream, was practically suspended on account of deterioration of the works. These five locks and dams were built by the State of Kentucky in 1836–1839, and from 1880 to 1885 were extensively repaired by the United States under appropriations for improving Kentucky River, Ky. Since then extensive repairs have been made under the indefinite appropriation act of 1884 (amended and reenacted by section 6 of the river and harbor act of March 3, 1909), for operating and care of canals, etc., and Locks and Dams Nos. 6, 7, 8, 9, 10, 11, and 12 have been constructed. Additional information will be found in the Annual Reports of the Chief of Engineers for 1906, part 1, page 543, and for 1907, part 1, pages 568–569.

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[1] Exclusive of amount available for fiscal year 1913.

Under allotments from the indefinite appropriation for operating and care of canals and other works of navigation there has been expended up to June 30, 1912, a total sum of $2,204,348.26. The amount expended during the year ending June 30, 1912, was $141,886.88.

The principal work has been the maintenance of navigable depths by dredging and snagging operations throughout the slack-watered portion of the river, and making repairs to locks, dams, and their appurtenances, including buildings and grounds and floating plant. The details are given in the report of the local officer, Appendix G G 6.

The total commerce for the fiscal year ending June 30, 1912, which consists principally of coal, sand and gravel, timber, tobacco, flour, and miscellaneous merchandise, was approximately 209,249 short tons, valued at about $2,638,880.24.

It is believed that the improvement has had no material effect on the nature of the commerce.

(See Appendix G G 6.)

7. *Guyandot River, W. Va.*—For reference to general description, project, etc., see Annual Report of the Chief of Engineers for 1902, pages 417 and 1945.

The method of improving this river has been by open-river regulation. Operations have been carried on from time to time, as money has been made available, in clearing the channel of obstructions and removing overhanging trees from the banks.

The amount expended prior to operations under existing project was $22,689.90.

The last work done on this river prior to operations under existing project was in 1899. No reliable record of the commerce has been retained; it consists almost entirely of timber floated to market as loose logs or in rafts, and would probably approximate 160,000 short tons per year.

The existing project, adopted by the river and harbor act approved June 25, 1910, provides for continuing improvement in accordance with plan printed in House Document No. 558, Sixtieth Congress, first session, and makes an appropriation of $5,000, not to exceed $2,000 of which, or so much thereof as may be necessary, to be expended in revetting the banks to confine the river to its present channel.

During the past year there were completed two stone-filled timber cribs to protect eroded banks near Barboursville, W. Va., and about 1,500 willow sprouts planted along the shore as an additional protection.

The total amount expended on existing project up to June 30, 1912, was $3,624.32, applied as follows:

General improvement	$1,625.48
Bank revetment	1,998.84

No estimate for further appropriation is submitted.

July 1, 1911, balance unexpended	$2,310.60
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	934.12
July 1, 1912, balance unexpended	1,376.48

(See Appendix G G 7.)

EXAMINATION AND SURVEY REQUIRED BY RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

The local officer was also charged with the duty of making a preliminary examination and survey, required by the river and harbor atc approved February 27, 1911, of *North Fork of Kentucky River, Ky., with a view to the removal of obstructions*, and reports thereon will be duly submitted when received.

IMPROVEMENT OF RIVERS AND HARBORS IN THE LOUISVILLE, KY. DISTRICT.

This district was in the charge of Maj. Lytle Brown, Corps of Engineers, to April 11, 1912, and Lieut. Col. Henry Jervey, Corps of Engineers, since that date, having under their immediate orders Capt. John J. Kingman, Corps of Engineers, since September 21, 1911. Division engineer, Lieut. Col. H. C. Newcomer, Corps of Engineers.

1. *Falls of the Ohio River at Louisville, Ky. (Lock and Dam No. 41).*—Improvements under this title have included the enlargement of the basin immediately above the locks of the Louisville and Portland Canal, the enlargement of the head of the canal, and straightening, deepening, and controlling the water flow in the Indiana Chute Channel.

The work of enlarging the basin above the canal locks was completed in 1893.

The original conditions at the other localities are more conveniently and fully described under separate headings, as follows:

Head of Louisville and Portland Canal.—Previous to 1883 the approach to the canal at its upper end, above the Louisville Bridge Co.'s bridge at Fourteenth Street, was so narrow as to constitute a source of much expensive delay to the large quantity of traffic which came down the river on ordinary rises. The canal proper from Ninth to Fourteenth Streets was only 100 feet wide and curved between the two points, so that progress was slow and accidents frequent and unavoidable. The greater part of the dike marking the north side of the approach to the canal was submerged when the river reached a stage of 8.4 feet, upper canal gauge, and at stages of 9 feet or more a strong current set out from the shore, thus carrying many vessels against the dike and, at high enough stages, over it onto the rock ledges. This approach was 1,800 feet long and varied in width from 400 feet at the upper end to 100 feet opposite Ninth Street. Its area was wholly insufficient for the required breaking and rearrangement of tows preparatory to entering or leaving the canal.

Indiana Chute.—This is the main channel of the river by which commerce passes over the falls when the stage of water is such as to permit navigation via that route. Originally it was very crooked, with swift currents and whirls, filled with dangerous rocky points projecting from the sides and bottom, and it could be navigated only at stages of 11 feet or more, upper canal gauge. Even at such stages the services of special skilled pilots of long local experience and having intimate knowledge of the channel conditions were essential for reasonably safe passage through it.

Projects.—The original project for the enlargement of the head of the Louisville & Portland Canal was adopted in 1883, and proposed the enlargement of the canal, beginning at a point a short distance below the railroad bridge at Fourteenth Street and extending eastwardly to the cross dam, so as to not only straighten and widen the canal proper, but also provide ample space for the necessary rearrangement of tows about to enter or leave the canal. This was slightly modified in 1885, so far as the location of the new north wall was concerned. A revision of the project was made by a board of engineer officers January 28, 1890, and approved by the Chief of Engineers January 31, 1890. This revision modified the area formerly proposed to be excavated and determined the number and kind of structures, etc., to be erected. As approved, it provided for enlarging the canal on its northerly side from a point 725 feet below the railroad bridge at Fourteenth Street, where the width of the canal was abruptly increased from 90 feet to 210 feet. This latter width is then gradually increased through a distance of nearly 2,800 feet to 325 feet at the head of the canal proper, at which point the enlargement is expanded into a capacious basin or harbor 1,200 feet wide and practically parallel to the Kentucky shore. The structures proposed were a new retaining wall on the north side of the canal, a movable dam about 800 feet long, a fixed dam extending from the movable dam at the westerly end of the basin to the south abutment of the movable dam in the Middle Chute opening of the cross dam, the excavation of rock within designated limits to the same grade as the canal bottom, the construction of certain walls and slope revetment on the south side of the canal, and the removal of the old structures within the limits of the proposed enlargement. Under date of March 31, 1899, a further modification of some of the details of the project was considered by a board of engineer officers, and their recommendations approved by the Chief of Engineers April 8, 1899. These later modifications, together with the work outlined in the report approved January 31, 1890, constitute the existing project, toward the completion of which operations were directed. The totals of estimates under the original project and the several revisions are as follows:

Project of 1883, p. 1539, Annual Report of the Chief of Engineers for 1883	$1,335,363.00
Revision approved Jan. 31, 1890, p. 2217, Annual Report of the Chief of Engineers for 1890	710,230.40
Modification approved Apr. 8, 1899, p. 2562, Annual Report of the Chief of Engineers for 1899	800,391.92
A revision of the latter estimate was made Nov. 13, 1900, approved by the Chief of Engineers Nov. 17, 1900, and amounted to	398,359.12

The foregoing relates particularly to the improvements at the head of the Louisville & Portland Canal.

Prior to January 31, 1890, there was no specific comprehensive project for the systematic improvement of the Indiana Chute Channel, although much work, consisting of the removal of some of the more dangerous rock ledges, had been done under estimates and allotments from appropriations for improving Ohio River. On the date just mentioned the project submitted by a board of Engineer officers for the radical improvement of this chute was approved by the Chief of Engineers. This project had for its object the widening and deepening of the channel by rock excavation to specified grades within certain limits and the control of water flow in the channel by means of dikes, etc., so as to make this channel available for descending navigation drawing 6½ feet at stages of 8 feet, upper canal gauge. However, only a part of the work necessary for the purpose in view was included in the estimate accompanying the report of the board, it being stated:

> As the exact knowledge of the results of that work [i. e., the work estimated for in the board's report] would be of great importance in fixing the details of location and cross section of the additional works that will be required, it would be as well to leave the determination of the additional work above the bridge to a later day.

The estimates for work on this chute since the adoption of a specific project therefor are as follows:

Project approved Jan. 31, 1890	$138, 610. 97
Modification approved Apr. 8, 1899	74, 320. 98
Revision of estimate approved by the Chief of Engineers Nov. 17, 1900	129, 651. 99

A consolidation of the projects for the enlargement at the head of the canal and the improvement of the Indiana Chute was authorized by the Chief of Engineers June 28, 1897, and since that date funds have been provided for work at both localities under one title of appropriation.

Work under that part of the project relating to the Indiana Chute having been completed, a board of Engineer officers was assembled to determine, as anticipated in the project of 1890, what further work was essential to provide the requisite depth necessary to facilitate the passage of traffic through this channel. The report of the board was submitted December 16, 1901, and approved by the Chief of Engineers December 30, 1901. The items of additional work found to be necessary to produce the desired result and the estimated cost thereof are as follows:

Submerged dam at Whirlpool Point (large stone), 2,500 cubic yards, at $3	$7. 500
Raising movable dam north of canal wall	2, 500
Removing old dam and building movable dam, 1,000 feet, at $75	75, 000
Longitudinal contracting dikes (concrete), 22.300 cubic yards, at $12	267. 600
Submerged dams below bridge (concrete). 3,000 cubic yards, at $20	60, 000
Rock excavation, 3,200 cubic yards, at $3.50	11, 200
Contingencies, 10 per cent	42, 380
Total	466, 180

For this latter work the board prescribed the order in which it should be done, and stated that it was possible that a part of the work might become unnecessary if certain results were produced by the submerged dam at Whirlpool Point, and in that event about $125,000 would probably be saved from the estimated cost.

Subsequently, in House Document No. 492, Sixtieth Congress, first session, the Ohio River board recommended the omission of all of the foregoing items, except that for removing the old dam and building a movable dam at the head of the falls (No. 41 of the series), and in lieu of such omitted items proposed the following to increase the facilities for passing the falls:

> (1) To widen the narrow portion of the canal to 170 feet, thus permitting the passage of a down-bound tow of loaded coal boats and an up-bound tow of empty coal boats, each tow three abreast; (2) to construct a new single-lift concrete

lock south of and by the side of the present lock, available dimensions of the chamber to be 85 feet by 600 feet, thus permitting the passage at one lockage of 9 coal boats or 12 coal barges; (3) to create a pool above the falls, with elevation of pool surface at 412.004 (9 feet on upper canal gauge), by the replacing of the wooden dam between Middle and Indiana chutes by a Boulé Dam, with crest at 412,004, which work is already provided for and under way, and by the construction of the sections of dam recommended by the district engineer officer in the project approved by the Chief of Engineers on December 28, 1903, with crests at 412.004 instead of 411.004, recommended therein, this height of crest being desirable for either a 6-foot or a 9-foot slack-water navigation, or even if the river is not further improved by the slack-water method; (4) to remove the rock necessary to complete the widening of the basin at the head of the canal contemplated by the present approved project; (5) to reconstruct the three sections of Boulé Dam just north of the head of canal with crest at 415.704, instead of crest at 412.504, as provided for in present project, thus eliminating the cross current across the head of the canal, which current now makes it very difficult for tows to enter the canal at stages between 8 and 12.7 feet. It is proposed to leave the crest of the present fixed concrete dam at 411.004 to serve as a fixed weir for the low-water discharge of the river.

All elevations are in feet above mean tide at Sandy Hook, N. J.

The estimated cost of the work proposed by this board is as follows:

Widening canal to 170 feet, etc	$673,000
New locks and appurtenances	773,000
New dams	240,000
Reconstructing Boulé Dam at head of canal	31,000
Removal of rock in basin	43,000
Total	1,760,000

The river and harbor act of June 25, 1910, adopted a canalization project for the entire river, in accordance with report printed in House Document No. 492, Sixtieth Congress, first session, or such modifications thereof as, in the discretion of the Secretary of War, may be advisable. This project includes the canal widening and new lock (items 1 and 2 of above estimate).

In order that Lock and Dam No. 41 may be of the same dimensions as the other locks and dams on the Ohio River, and in order that future navigation may be adequately provided for, the Secretary of War, under date of March 24, 1911, exercised the authority granted him by the act of June 25, 1910, and approved a modification of the existing project by increasing the canal prism from 170 feet to 200 feet, and by increasing the width of the new lock (No. 41 of the series) from 85 feet to 110 feet, at an increase in cost of $431,500.

EXISTING PROJECT.

As now approved the existing project proposes: (1) to widen the narrow portion of the canal to 200 feet; (2) construct a new single-lift concrete lock south of and by the side of the present lock, available dimensions of new lock to be 110 feet by 600 feet; (3) remove certain rock from basin at head of canal; and (4) create a pool above the falls, with elevation of pool surface at 412.004 (9 feet on upper canal gauge), by the reconstruction of old sections and building new sections of dam where none previously existed.

The estimate for this work is itemized as follows:

Widening the canal to 200 feet, etc	$936,031
New lock and appurtenances	1,710,325
New dams and reconstructing Boulé Dam at head of canal	271,000
Removal of rock in basin	43,000
Total	2,960,356

The act of March 2, 1907, provided for the completion of the third and fourth items and the work has been done, thus leaving only the first and second items as the remainder of the existing project to be completed, for which the estimate amounts to $2,646,356.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Enlargement at head of canal [1]					1883	1539
Enlargement at head of canal and Indiana Chute.[2]					1890	2217
Indiana Chute and head of canal [2]					1899	2562
Dam and Indiana Chute [1]					1902	1970

[1] Contains maps.

[2] No maps.

Expenditures during the fiscal year 1912 were for items as follows:

Land	$99, 408. 50
Contract work, south side of canal	69, 549. 69
Two maneuver boats	14, 910. 05
Office extension	1, 331. 05
Salaries of officers and employees	10, 005. 88
Miscellaneous	480. 06
Total	195, 685. 23

Following is a brief synopsis of expenditures under the allotments and projects summarized above:

Expended from allotments, 1881, to Jan. 31, 1890		$116, 049. 80
Expended under project of 1883, for enlargement of head of canal, to Jan. 31, 1890		347, 380. 68
Reserved, Office Chief of Engineers, United States Army		1, 874. 20
Expended under project for enlarging canal basin at locks		133, 000. 00
Expended under revised project of Jan. 31, 1890, to June 30, 1897:		
On enlargement at head of canal	$298, 856. 35	
On Indiana Chute channel	103, 602. 81	
		402, 459. 16
Expended under appropriations for enlargement at head of canal and Indiana Chute, in accordance with project of Jan. 31, 1890, to Mar. 31, 1899		208, 659. 75
Expended under appropriations for enlargement at head of canal and Indiana Chute, in accordance with the modified project of Mar. 31, 1899 (approved Apr. 8, 1899)		459, 075. 27
Expended under the project recommended by the Ohio River Board, as modified by the Secretary of War		506, 408. 70
Total		2, 174, 907. 56

There was received during the fiscal year 1912, from sale of old buildings on land purchased for the enlargement of the canal, the sum of $1,670.

The work of excavating and the subsequent construction of the new lock on the south side of the present lock is being prosecuted under continuing contract appropriations; the balance of authorization remaining to be appropriated under 1911 authorization is $330,000, and full amount of authorization of 1912, $730,000.

Figured from estimated cost and expenditures to date, approximately 17 per cent of the existing project has been completed; however, expenditures under the contract for the new lock amount to only about 10 per cent of the contract price, and no contract has thus far been made for widening the canal, as no funds have been made available for that purpose.

The results derived from the expenditures to date have been of marked advantage to traffic and commerce and greatly facilitate their movement. The enlargement of the basin immediately above the locks, completed in 1893, increased the width of the canal at that locality from 90 feet to 215 feet throughout a distance of 800 feet. The enlargement at the head of the canal, completed during the fiscal year 1910, begins at a point 725 feet below the Fourteenth Street railroad bridge and extends eastwardly to a short distance above the dam, and affords a capacious basin varying in width from 210 feet to 1,200 feet.

In the Indiana Chute above the Fourteenth Street bridge the channel width has been increased from 200 feet to 400 feet, and all rock within these limits excavated to grades specified in the project. At Wave Rock and Willow Point all excavation and the dikes have been completed. The depth of water over Wave Rock and Willow Point approximates very closely the depth anticipated, i. e., 8 feet when there are 8 feet on the upper canal gauge. But that result was not attained for the upper portion of the chute; however, it can now be navigated with ease by heavy-draft coal boats at stages of 11.5 feet or more, upper canal gauge.

The new dam is of such height as to afford a minimum depth of 9 feet upstream to Madison, Ind., and a minimum depth of 6 feet on the lower miter sill at Lock No. 1, Kentucky River.

Commercial statistics are given in connection with the report for operating and care of Louisville & Portland Canal.

No information is available as to what, if any, effect the project has on freight rates.

It is proposed to apply the amount now available toward building the new lock. The amount recommended for expenditure during fiscal year 1914 is to be applied toward payments for contract work, at present it being expected to execute the majority of the work under two contracts, one of which will cover that to be done on the north side of the canal and the other that to be done on the south side of the canal, including the new lock, which arrangement, it is anticipated, will be favorable to rapid progress.

LOCK AND DAM NO. 41.[1]

July 1, 1911, balance unexpended	[2] $354,946.53
June 30, 1912, amount expended during fiscal year, for works of improvement	195,685.23
July 1, 1912, balance unexpended	159,261.30
July 1, 1912, outstanding liabilities	31,063.66

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[1] The funds derived from the appropriations and continuing-contract authorizations carried by the river and harbor acts of 1910 and subsequent years are apportioned by the Chief of Engineers to the several locks and dams, after recommendation by the Board of Engineers having general supervision over slack-water improvement of the Ohio River.

[2] Including $1,670 received from sale of old buildings Mar. 1, 1912, and excluding $50,000 transferred from this work for purchase of sites, surveys, etc., Dec. 29, 1911, and Apr. 19, 1912.

July 1, 1912, balance available	$128,197.64
Amount allotted from appropriation made by sundry civil act approved Aug. 24, 1912	570,000.00
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	420,000.00
Amount available for fiscal year ending June 30, 1913	1,118,197.64
July 1, 1912, amount covered by uncompleted contracts	922,008.68
Amount of continuing contract authorization, acts of 1911 and 1912	1,630,000.00
Amount appropriated under such authorization	570,000.00
Amount yet to be appropriated	1,060,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 1,256,356.28
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	(2)

(See Appendix H H 1.)

2. *Operating and care of Louisville & Portland Canal.*—This canal was constructed by a private corporation acting under a charter granted by the Kentucky Legislature in 1825 and subsequent acts of the same body extending the time for completion and increasing the capital stock. It was completed and the first boat passed through it December 22, 1830. At that time there were three combined lift locks, each with a lift of about 8¾ feet, a width of 50 feet, and a length of 200 feet. The width of the canal proper was from 64 to 68 feet at normal stages, with a depth of nearly 3 feet at extreme low stages of the river. There was no dam at the head of the canal. The United States became a stockholder in the corporation in 1826, and gradually increased its holdings until all of the outstanding stock and bonds passed into its possession.

In 1860 an enlargement and extension of the canal, which included new locks, was begun under the corporate management and resulted in the width of the canal being increased to 90 feet, with three basins, or passing places, and the construction of two new combined lift locks, with a total lift of about 26 feet. Each of the chambers of the new locks has a width of 80 feet and an available length of 350 feet. The new locks were opened to navigation February 6, 1872.

The United States assumed charge of the work of enlargement of the canal and construction of a dam at the head of the canal subsequent to the allotment of funds for that purpose in 1868, but the operation of the canal and collection of tolls remained under control of the corporate management until June 11, 1874, upon which date the entire control of the canal was assumed by the United States, pursuant to the act of Congress of May 11, 1874, which provided that the canal should be held "free of all tolls and charges, except such as are necessary to pay the current expenses of said canal and keep the same in repair." Tolls were entirely abolished after midnight July 1, 1880, and since that date the expenses of operation and maintenance of the canal have been borne directly by Treasury funds made available by the act of March 3, 1881, and the indefinite appropriation for "Operating and care of canals and other works of navigation," act of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909.

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[1] Exclusive of amount available for fiscal year 1913.
[2] See p. 1278 of this report.

The general project for operation and care of the canal by expenditures under allotments from these acts contemplates the operation of the canal locks, the operation of the dredging plant to keep the canal clear of deposit brought into it by high water, and the repair of existing structures, so as to maintain the whole system in good serviceable condition. The funds are provided under estimates submitted annually at the beginning of each fiscal year and allotments therefor.

The approved project, estimate, and allotment for the fiscal year 1912, in addition to the provisions for ordinary current supplies, miscellaneous work of maintenance, operation of locks and dredging plant, included items for new upper, middle, and lower gates of wood, new steel hull for the towboat *Cherokee*, and maneuvering the dam. The estimate for the year amounted to $138,174, and the funds thereunder made available July 15, 1911.

In reporting the total of expenditures made in connection with this work it seems best, for the purpose of clearness in showing the general application, to subdivide the total to date into amounts for each period indicated, as follows:

From allotments and appropriations, Sept., 1868, to June 30, 1882, for completion of new locks, enlargement of canal, and for cross dam at head of canal, payment of bonds, etc	$1,463,200.00
From tolls collected by United States, June 11, 1874, to midnight July 1, 1880, for operation and maintenance	417,069.38
From allotments from act of Mar. 3, 1881, for operation and maintenance	214,062.91
From allotments from act of July 5, 1884, for operation and maintenance	2,133,565.82
From allotments from act of Mar. 3, 1909, for operation and maintenance	274,860.18
Total	4,502,758.29

The amount expended during the past fiscal year for operation and maintenance is $119,649.21, not including outstanding liabilities June 30, 1912.

The canal is available to commerce at all stages of the river less than 12.7 feet, upper canal gauge, and affords free navigation around the Falls of the Ohio River at stages of water when the passage can not be made by the river channel.

The zero of the upper canal gauge is 403.004 feet above mean tide at Sandy Hook, N. J. The lowest recorded reading of the upper gauge is 1.7 feet; the highest reading on the same gauge is 46.7 feet.

Under the regulations prescribed by the Secretary of War for the use, administration, and navigation of this canal the maximum draft of vessels that can be passed through the canal is limited to the depth of water above zero of the gauge at the time the boat enters the canal.

References to more extended information concerning original condition, purchase, and progress of the improvement of this canal are given on page 491, Annual Report of the Chief of Engineers for 1904.

During the past fiscal year ending June 30, 1912, 4,834 boats, barges, and small craft passed through the canal, carrying 944,656½ short tons of freight. During the same period 1,315 boats, barges, and small craft passed over the falls via the open-river channel, carrying 298,394 short tons of freight, thus making the aggregate movement 6,149 boats, barges, and small craft and 1,243,050 tons of freight.

For a comparative statement of traffic and commerce at this locality for the past 18 years see the report on this work by the district officer.

Reports upon examinations and surveys may be found as follows:

Report of W. D. Gallagher, special agent, Treasury Department, September 30, 1867, concerning interest of the United States in the Louisville & Portland Canal, legislation, financial affairs, condition of work, etc. (H. Mis. Doc. No. 83, 40th Cong., 2d sess.)

Report of the House Committee on Railways and Canals, recommending that the Louisville & Portland Canal be made free from toll. (H. Rept. No. 348, 46th Cong., 2d sess.)

Special report made in response to resolution of the Senate of the United States calling for information as to "what, if any, additional works are necessary at the Falls of the Ohio River to complete the improvement thereof in a manner to serve the interests of the commerce of the Ohio River," etc. (Annual Report Chief of Engineers for 1882, p. 1880.) This report briefly describes original condition, the construction of the canal by the stock company, conditions at the time the United States assumed charge of the improvement of the canal, discusses additional works deemed necessary, and gives estimates of cost. The report, accompanied by the maps referred to in it, may also be found in Senate Executive Document No. 129, Forty-seventh Congress, first session.

Report on drainage rights, Louisville & Portland Canal, accompanied by map showing location of sewers emptying into the canal. (H. Ex. Doc. No. 51, 49th Cong., 2d sess.) The report with map omitted may also be found on page 1852, Annual Report Chief of Engineers for 1887.

Report as to whether or not the Government dry dock at the Louisville & Portland Canal is adequate for the purposes of commerce, and what alterations, if any, are necessary, and the cost of making same (pp. 1896–1901, Annual Report Chief of Engineers for 1887).

(See Appendix H H 2.)

3. Lock and Dam No. 43, Ohio River, near New Amsterdam, Ind.—This lock and dam is included in the project for the improvement of the Ohio River, with a view to securing a navigable depth of 9 feet, in accordance with report submitted in House Document No. 492, Sixtieth Congress, first session. Funds for beginning the work were provided by allotment from the appropriation made in the river and harbor act approved July 25, 1912.

The estimated cost of this lock and dam is $1,480,000.

In addition to the allotment mentioned above ($550,000) of the cash appropriation made by the act of 1912, the sum of $600,000 of the continuing-contract authorization provided by this act was also allotted to the work.

No work has yet been done, but negotiations toward the purchase of the lock and abutment sites are now in progress.

LOCK AND DAM NO. 48.[1]

Amount allotted from appropriation made by river and harbor act approved July 25, 1912	$550,000
Amount available for fiscal year ending June 30, 1913	550,000
Amount of continuing-contract authorization, act of July 25, 1912	600,000
Amount yet to be appropriated	600,000
Amount (estimated) required to be appropriated for completion of existing project	[2]930,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	([3])

4. Lock and Dam No. 48, Ohio River, near Henderson, Ky.—This lock and dam is included in the project for the improvement of the Ohio River, with a view to securing a navigable depth of 9 feet, in accordance with report submitted in House Document No. 492, Sixtieth Congress, first session. Funds for beginning the work were provided by allotment from the appropriation made in the river and harbor act of July 25, 1910.

The estimated cost of the lock and dam is $1,840,000.

The amount expended up to the close of the fiscal year 1912 is $34,970.69, not including outstanding liabilities June 30, 1912.

Expenditures during the fiscal year 1912 were for items as follows:

Material for contract work	$19,833.80
Land	4,961.50
Office quarter boat, equipment, etc	3,280.00
Officers' and employees' salaries	4,828.57
Miscellaneous	1,015.69
Total	33,919.56

The work is being prosecuted under continuing-contract appropriations, and the balance of authorization remaining to be appropriated June 30, 1912, is $900,000.

Figured from estimated cost and expenditures to date, approximately 19 per cent of the existing project has been completed. However, expenditures under "first contract" amount to only about 10½ per cent of the amount of that contract, the payments being entirely for material delivered but not yet placed in the work.

It is proposed to expend the amount now available toward payments for work under the first contract. The amount estimated for expenditure in fiscal year ending June 30, 1914, is to be applied to that and subsequent contracts for movable parts of the lock and dam for power houses, machinery, etc.

LOCK AND DAM NO. 48.[1]

July 1, 1911, balance unexpended	$483,948.87
June 30, 1912, amount expended during fiscal year, for works of improvement	33,919.56
July 1, 1912, balance unexpended	450,029.31
July 1, 1912, outstanding liabilities	4,494.38

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[1] The funds derived from the appropriations and continuing-contract authorizations carried by the river and harbor acts of 1910 and subsequent years are apportioned by the Chief of Engineers to the several locks and dams, after recommendation by the Board of engineers having general supervision over the slack-water improvement of the Ohio River.

[2] Exclusive of amount available for fiscal year 1913.

[3] See p. 1278 of this report.

July 1, 1912, balance available	$445,534.93
July 1, 1912, amount covered by uncompleted contracts	1,338,248.05
Amount of continuing-contract authorization, act of Feb. 27, 1911	900,000.00
Amount yet to be appropriated	900,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 1,355,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	(2)

(See Appendix H H 3.)

5. Operating and care of lock and dam at Grand Rapids, Wabash River.—This lock and dam was built from funds derived from appropriations for improving Wabash River, Indiana and Illinois, and opened to navigation in November, 1893. The available length of the lock is 214 feet; width, 52 feet; depth on lower miter sill at low water, 3.5 feet; depth on upper miter sill at normal pool stage, 5.08 feet. At such stage the pool above the lock affords slack-water navigation about 12 miles, and the maximum draft that can be carried is about 2 feet.

The expenses of operating the lock were paid from the appropriations for improvement of the river until March 1, 1897, since which date they have been paid from annual allotments from the indefinite appropriation for "Operating and care of canals and other works of navigation," act of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909.

The first and subsequent annual projects proposed the operation of the lock and the maintenance of it and the appurtenant structures in good serviceable condition. The expenditures under these projects to June 30, 1912, amounted to $79,132.96.

The project for the fiscal year 1912 provided for the operation and care of the lock, ordinary current repairs to the buildings at the lock, repairs to the dam, etc., at an estimated cost of $8,972.44, which was made available July 17, 1911.

The amount expended during the fiscal year ending June 30, 1912, not including outstanding liabilities, is $3,007.98.

In addition to the ordinary work of operating the lock and minor repairs to buildings, fences, etc., 280 linear feet of the lower slope of the dam was repaired with new stringers and sheeting.

During the past fiscal year 1,231 boats, barges, etc., 2,010 short tons of freight, and 768 passengers passed the lock.

A comparative statement of traffic and commerce passing the lock during the past 15 years will be found in the report on this work by the district officer.

Further information may be found as follows:

Reports on preliminary surveys may be found on page 458, Annual Report of the Chief of Engineers, fiscal year 1871, and page 472, Annual Report of the Chief of Engineers, fiscal year 1872.

Preliminary examination, Logansport to Delphi, page 1649, Annual Report of the Chief of Engineers, fiscal year 1885.

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[1] Exclusive of balance unexpended July 1, 1912.

[2] See p. 1278 of this report.

Preliminary examination, Terre Haute to Lafayette, page 2411, Annual Report of the Chief of Engineers, fiscal year 1891; also House Document No. 65, Fifty-first Congress, second session.

Preliminary examination, above Vincennes to Perrysville, page 2726, Annual Report of the Chief of Engineers, fiscal year 1904; also House Document No. 196, Fifty-eighth Congress, second session.

Survey, from Vincennes to mouth of river, page 2729, Annual Report of the Chief of Engineers, fiscal year 1904; also House Document No. 568, Fifty-eighth Congress, second session.

Preliminary examination, Mount Carmel to mouth of river, House Document No. 246, Sixty-first Congress, second session.

None of the foregoing contain maps.

(See Appendix H H 4.)

6. *Operating and care of locks and dams on Green and Barren Rivers, Ky.*—The original system of slack-water navigation on these rivers, including 4 locks in Green River and 1 lock in Barren River, with a total length of pools of approximately 200 miles, was completed by the State of Kentucky in 1841. The State retained control and management of the system until 1868, when it was leased to the Green & Barren River Navigation Co. for a term of 30 years. The act of the Kentucky Legislature, approved February 20, 1886, ceded the entire system to the United States upon condition that the unexpired portion of the lease to the navigation company be purchased by the United States. The river and harbor act of August 11, 1888, appropriated $135,000 "for the purchase of the improvements known as the Green and Barren River improvements." The deed from the Green & Barren River Navigation Co. relinquishing all their rights, privileges, etc., having been duly approved by the Attorney General of the United States, and the purchase money paid to said company, the Government assumed control of the river, the improvements therein, and the property formerly owned by the State December 11, 1888.

The condition of the improvements and of the rivers at that date was as follows: Lock and Dam No. 1, Green River, required many repairs. The walls of Lock No. 2 were cracked and in bad condition generally, the land wall especially so, it being held in position by anchorage to cribs filled with stone; the river wall had yielded outward. Lock No. 3, Green River, was broken entirely, the river wall having yielded outward and fallen into the river. Lock and Dam No. 4, Green River, was in fairly good condition, with the exception of needed repairs to the quoins and gates. The walls of Lock No. 1, Barren River, were so badly cracked that a part of one of them, the land wall, leaned toward the lock chamber about 6 inches and was liable to fall at any time. The entrances to the locks were obstructed with deposit and the pools with great numbers of snags, overhanging trees, etc.; the appurtenant structures at the locks and the lock tenders' dwellings were in bad condition and inadequate. No snagging or dredging plant was available.

Excepting the funds for rebuilding Lock No. 2, Green River, which were provided by specific appropriations, the funds for the restoration of former structures, the operation of the locks, and maintenance of the system in good navigable condition have been provided by allotments from the indefinite appropriation for "Operating and care of canals and other works of navigation," act of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909, under estimates submitted annually at the beginning of each fiscal year. The first project for work on these rivers under the latter act was approved January 4, 1889, and proposed the restoration, so far as practicable, of the former structures to good serviceable condition, the construction of new ones where required, the operation of the locks, the removal of snags, landslides, and deposit from the entrances to the locks, etc., and such has been the general object of each subsequent annual estimate and project.

In addition to the items for the usual work of operation and maintenance, the project and estimate for the fiscal year 1912 provided for the completion of the reconstruction of the lower shore guide crib and the renewal of 140 feet of the upper shore guide crib at Lock No. 1, Green River; the setting up in place of steel upper gates at Lock No. 2, Green River; the completion of upper shore guide wall, renewal of quoins, heel posts and valves in lower gates at Lock No. 3, Green River; filling washout near lower shore guide wall at Lock No. 4, Green River; completing protection crib below abutment at Lock No. 5, Green River; repairs to river wall, and gates at Lock No. 6, Green River; new upper gates and miter wall at Lock No. 1; Barren River; the construction of a new office building at Lock No. 4, Green River; the usual current repairs to floating plant, buildings, locks, dams, etc. The estimate for the fiscal year amounted to $81,048, and the funds were made available July 17, 1911.

Expenditures during the fiscal year 1912 amounted to $67,777.86, not including outstanding liabilities June 30, 1912.

The aggregate of expenditures under the project of January 4, 1889, and subsequent annual projects to June 30, 1912, is $1,718,199.59.

The result of these expenditures is the thorough repair of the several locks of the former system and their appurtenant structures, their maintenance, together with the new locks, and the restoration of through navigation in the pools from Lock No. 1, Green River, to Bowling Green, Ky., on Barren River, a distance of 172 miles, for boats not exceeding 35 feet in width, 138 feet in length, and draft not exceeding 5 feet.

At extreme low water in the open river below Lock No. 1, Green River, there is a depth of only 1 foot on the lower miter sill at that lock, which is located 8 miles above the mouth of the river. This condition will be bettered upon the completion of Dam No. 48, Ohio River, of which the upper pool will have an elevation such as to afford a depth of about 9.3 feet on the lower sill at Lock No. 1, Green River.

The system now includes 7 locks and dams, Locks Nos. 5 and 6, Green River, having been built from funds provided by specific appropriations, thus affording slack-water navigation from Lock No. 1, Green River, to Bowling Green, Ky., on Barren River, and to Mammoth Cave, Ky., on Green River; the total length of pool is 219 miles.

Following is a synopsis of traffic and commerce through the locks during the fiscal year:

	Boats.	Freight.
Green River:		*Short tons.*
Lock No 1	[illegible]	[illegible]
Lock No. 2	2,641	[illegible]
Lock No. 3	2,542	175,[illegible]
Lock No. 4	2,476	[illegible]
Lock No. 5	1,444	[illegible]
Lock No. 6	1,676	40,581
Barren River, Lock No. 1	[illegible]	[illegible]

A comparative statement of the traffic and commerce on these rivers will be found in the report on this work by the district officer.

Further information may be found as follows:

Survey of Green, Muddy, and Barren Rivers, page 1799, Annual Report, Chief of Engineers, fiscal year 1880.[1]

Report on condition of Green and Barren Rivers, description of principal features of locks, etc., page 1904, Annual Report, Chief of Engineers, fiscal year 1885.[1]

Report on commercial value and importance, page 1903, Annual Report, Chief of Engineers, fiscal year 1887; also House Document No. 111, Forty-ninth Congress, second session.[1]

Examination Big Barren River above Bowling Green, page 2474, Annual Report, Chief of Engineers, and House Document No. 15, Fifty-first Congress, second session.[1]

Survey of Green River, at or near its mouth, page 2504, Annual Report, Chief of Engineers, fiscal year, 1897; also House Document No. 30, Fifty-fifth Congress, first session.[1]

Examination Green River, Mammoth Cave to Greensburg, page 3542, Annual Report, Chief of Engineers, fiscal year 1900; also House Document No. 103, Fifty-sixth Congress, first session.[1]

Examination Green River, Lock No. 6 to Munfordville, House Document No. 377, Fifty-ninth Congress, first session.[1]

(See Appendix H H 5.)

7. *Operating and care of lock and dam on Rough River, Ky.*—This lock and dam was built with funds provided in appropriations for improving Rough River, Ky., and opened to navigation December 12, 1896. The lock has an available length of 123 feet, width of 27 feet, and depth on upper miter sill at normal pool stage of 6.8 feet. At such stage the pool above the lock affords slack-water navigation 21½ miles to a short distance above Hartford, Ky., for boats with draft not exceeding 4 feet.

The expense of operating the lock was paid from the appropriation for improvement until June 30, 1897; since that date the expenses of operating, care, etc., have been borne by the indefinite appropriation for operating and care of canals and other works of navigation, act of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909, the funds being made available by allotment for projects and estimates submitted annually at the beginning of each fiscal year.

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[1] No maps.

The project for the fiscal year 1912 proposed to operate the lock; maintain it and the dam in good condition; remove deposit from the lock chamber and entrances thereto; keep the pools clear of snags, and maintain the buildings, etc., at the lock in good condition. The estimate for the fiscal year 1912 amounted to $2,058, and the funds were made available July 17, 1911.

Expenditures during the fiscal year amounted to $1,044.87, exclusive of outstanding liabilities June 30, 1912.

The total of expenditures from July 1, 1897, to June 30, 1912, is $19,862.44.

Traffic through the lock during the past fiscal year included 724 boats, barges, etc., carrying 31,506 short tons of freight.

A comparative statement of traffic and commerce on this river during the past 21 years will be found in the report on this work by the district officer.

(See Appendix H H 6.)

EXAMINATIONS AND SURVEYS REQUIRED BY RIVER AND HARBOR ACTS APPROVED JUNE 25, 1910, AND FEBRUARY 27, 1911.

The local officer was charged with the duty of making preliminary examinations and surveys provided for by the river and harbor acts approved June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. Wabash River, Ind. and Ill., from its mouth to Terre Haute, with special report as to improving said river up to Mount Carmel by dredging.

2. Green River, Ky., with a view to an extension of the present system of locks and dams.

3. Green River, Ky., at and near Lock and Dam No. 3, near Rochester, with a view to the diversion of the waters of Mud River from its present mouth above the said lock and dam to a suitable point below.

IMPROVEMENT OF RIVERS AND HARBORS IN THE DULUTH, MINN., DISTRICT.

This district was in the charge of Lieut. Col. Francis R. Shunk, Corps of Engineers, with the exception of a little more than one month, February 1 to March 12, 1912, when it was in charge of First Lieut. John N. Hodges, Corps of Engineers. Division engineer, Col. C. McD. Townsend, Corps of Engineers.

1. Harbor at Grand Marais, Minn.—Situated on the north shore of Lake Superior, 110 miles northeasterly from Duluth. A natural bay, one-half mile long and one-fourth mile wide, with a total area of 61 acres. It has an opening on the south side, which was originally about 1,000 feet in width. Before improvement there was a maximum depth of 14 feet over a very limited area, the general average depth being only 8 or 9 feet at mean low water.

Congress, by act of March 3, 1879, appropriated $10,000 for its improvement.

The approved project of 1879 is to build two breakwater piers, each 350 feet long, from the east and west points of the bay, or one pier 700 feet long from the east point, and dredge an anchorage area of about 26 acres to a depth of at least 16 feet, all at an estimated cost of $139,669.40. For reasons explained in the report of the local officer (Annual Report of the Chief of Engineers for 1898, p. 2217), this estimate was increased to $163,954.63.

The existing project, with modifications, is to build two breakwater piers, each 350 feet long, from the east and west points of the bay, or one pier 700 feet long from the east point, and dredge an anchorage area of about 26 acres to a depth of at least 16 feet, all at an estimated cost of $163,954.63.

There were no expenditures by the Government prior to the existing project.

A survey of this harbor was made in 1874, the results of which were published in part 1, House Executive Document No. 75, Forty-third Congress, second session.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Building entrance piers and dredging basin.[1]	House	75	Forty-third	Second	....	40
					1875	184
					1881	2032
					1887	1854
					1890	2232
Harbor map	do	[2] 213	Fifty-eighth	do	1903[1]	1792
					1904	2783
Rebuilding entrance piers and enlarging basin.[1]	do	939	Sixtieth	First	1908	648

[1] Contains map. [2] No map.

The further improvement recommended in last survey report consists in enlarging the harbor basin by dredging an additional area to a depth of 16 feet, at an estimated cost of $70,416. This work has not yet been authorized by Congress.

Two breakwaters, each 350 feet long, have been constructed from the east and west points of the bay, the work being completed on August 13, 1901.

The amount expended on the project up to the close of the fiscal year ending June 30, 1912, not including outstanding liabilities, was $166,431.74, of which about $5,495.06 was for maintenance.

The expenditures during the year were for incidental expenses and contingencies.

The approved project has been completed. The work done has resulted in a more protected harbor and a 16-foot anchorage area of 26 acres.

The minimum mean low-water depth over the shoalest part of the locality under improvement is 15 feet.

The usual variation of water level extends from about 0 to +1 foot above low-water datum, this plane of reference being a mean low-water level. It is referred to permanent bench marks.

In the original condition of the bay a small commercial business could have been transacted by means of tugs or other vessels of small draft at risk of exposure to storms, and logs could have been rafted to other ports on the lake, also at risk of loss, to be sawed into lumber; but the present commerce of this port could not have been carried on.

The United States improvements have therefore been an indispensable agency in the development of business where none previously existed, and this may be of greater value and importance than a simple reduction of rates.

This harbor is of much use to navigation by reason of the refuge it affords. It is the only sheltered harbor in the stretch of 116 miles along the north shore of the lake between Agate Bay (Two Harbors) and Grand Portage Bay, and the coast is rugged and dangerous.

The commerce of the port has increased from 25 entrances and clearances, made by four tugs and five schooners, with 60 short tons of cargo, valued at $6,000, in 1878, to 920 clearances and entrances, all steamers, with 9,727 short tons of cargo, valued at $175,125, in 1911.

The value of the commerce of the harbor from 1878 to 1911, both inclusive, is estimated at $13,405,601.

The freight tonnage in 1911 was 37 per cent less than in 1910.

The total expenditures by the Government for this harbor to date are 1¼ per cent of the value of the vessel freight received and shipped during the period covered by these expenditures.

The annual expense of Government operations at this harbor, consisting of maintenance, interest, and depreciation, is approximately $8,213. This amounts to $0.84 per ton of vessel freight for the year 1911 and to 4½ per cent of the value of this freight. Further details of these comparisons may be seen in Table 4, Appendix I I, of this report.

Effect of project on freight rates: There are no railroads running to this harbor, and the only means of transportation is by water, so that no comparison can be made with railroad charges.

The available balance will be expended for repairs and maintenance as necessity arises.

July 1, 1911, balance unexpended	$8,022.83
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	104.57
July 1, 1912, balance unexpended	7,918.26

(See Appendix I I 1.)

2. *Harbor at Agate Bay, Minn.*—This harbor, an important shipping port for iron ore, is situated on the north shore of Lake Superior, 27 miles northeast from Duluth, Minn. It is a natural bay or indentation three-fourths of a mile long by one-half mile wide.

Before improvement there was ample depth for navigation, with 18 feet or more at mean low water over the greater portion of the harbor, but the harbor was exposed to storms from the southwest and to reverse swells from severe northeast storms.

The project approved by the Secretary of War January 4, 1887, was to construct two breakwater piers on a line toward each other from the eastern and western points of the bay, to be 1,000 and 900 feet long, respectively, leaving an opening of 1,340 feet between their extremities and inclosing an area of 109 acres.

Improvement of this harbor authorized by Congress by act of August 5, 1886. An examination and survey report was printed in House Document No. 94, Forty-eighth Congress, second session.

In 1899 the total ultimate length of the easterly breakwater was increased by 50 feet.

The original estimate of cost was $213,000, which was increased to $244,208 (see Annual Report of the Chief of Engineers for 1887) on account of higher prices.

The existing project with modifications is to construct two breakwater piers on a line toward each other from the eastern and western points of the bay, to be 1,050 and 900 feet long, respectively, leaving an opening of 1,340 feet between their extremities and inclosing an area of 109 acres at an estimated cost of $244,208.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Breakwater construction and dredging.[1]	House	94	Forty-eighth	Second	1885	1964
Breakwater construction [1]					1887	1962
Burlington Bay [1]	House	114	Fifty-sixth	Second	1901	2850
Harbor map [1]					1903	1793

[1] Contains map.

The amount expended on the approved project up to the close of the fiscal year ending June 30, 1912, not including outstanding liabilities, was $255,577.45, of which about $21,519.92 was applied to the maintenance of the improvement.

The amount expended during the year was for incidental expenses and contingencies.

The project was completed on November 1, 1901, and fulfills very effectually the purpose for which it was designed.

The depth at the entrance is over 50 feet, and vessels drawing 20 feet can reach the ore docks in safety.

The usual variation of water level extends from about 0 to about +1 foot above low-water datum, this plane of reference being a mean low-water level. It is referred to permanent bench marks.

The commerce of the port has increased from 174 arrivals and clearances of vessels in 1885, with 263,437 short tons of freight, valued at $876,613, to 2,394 arrivals and clearances in 1911, with 7,422,559 short tons, valued at $23,547,459.

The total value of the commerce of this port from 1887 to 1911, both years inclusive, is $289,678,689.

The total expenditures by the Government for this harbor to date are less than one-tenth of 1 per cent of the value of the vessel freight received and shipped during the period covered by these expenditures.

The annual expense of Government operations at this harbor, consisting of maintenance, interest on cost of improvement, and depreciation, is approximately $14,871. This amounts to $0.002 per ton of the vessel freight for the year 1911 and to less than one-seventeenth of 1 per cent of the value of this freight, and is one-tenth of 1 per cent of the saving in the cost of transportation on this freight by water as compared with rail rates. Details of these comparisons may be seen in Table 4, Appendix I I 2, of this report.

Effect of project on freight rates: It is estimated that the saving in cost of transportation by water as compared with that by rail for the receipts and shipments of this harbor is approximately $1.92 per ton, which amounts to $14.251,313 for the year 1911. This is more than 61 per cent of the value of the receipts and shipments for the same year. The Government improvements have been an indispensable aid to this commerce. (See the following report for harbor at Duluth, Minn., and Superior, Wis.)

The available balance will be expended for repairs and maintenance. The work proposed is for the purpose of making the improvement available.

July 1, 1911, balance unexpended	$5,309.82
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	100.58
July 1, 1912, balance unexpended	5,209.24

(See Appendix I I 2.)

3. Harbor at Duluth, Minn., and Superior, Wis.—This harbor is situated at the extreme western end of Lake Superior, and forms a terminus of the Great Lakes waterway. The area of this harbor is 19 square miles, of which 11 square miles are available for wharves and slips and 8 square miles are outside harbor lines and available for channels and basins.

Previous to the Annual Report of 1897 this harbor was reported on under the separate heads of Duluth, Minn., and Superior, Wis., respectively.

The act of June 3, 1896, unified these harbors under the above title and provided for continuous contracts for its improvement to the amount of $3,130,553.

This harbor consists of the Duluth Canal, the Wisconsin Entrance, Superior Bay, Allouez Bay, St. Louis Bay, and St. Louis River to the limits of the cities of Duluth and Superior, about 20 miles from the original natural entry, which before improvement was obstructed by shifting bars with but 9 feet of water over them. The bays were broad expanses of shallow water, averaging only 8 or 9 feet, except along a natural channel through them where the depth was greater, but variable. Depths given in this report are referred to low-water datum, which is a mean low-water level.

The project adopted by the act of March 3, 1881, previous to the present one, was for 16-foot navigation. This was practically completed July 1, 1897, and resulted in giving a good 16-foot navigation through the natural or Wisconsin entry, through the artificial Duluth Canal, over the Duluth Basin of 104 acres, along and parallel to the principal dock lines of Duluth and Superior in Superior and St. Louis Bays, and up the St. Louis River to New Duluth, near the head of navigation of the river, with well-defined channels of from 85 to 300 feet in width.

The amount expended on the project of March 3, 1881, and projects prior to operations under existing project was $1,548,183.

The present project, authorized by the act of June 3, 1896, and by the modifications of August 14, 1896, and May 9, 1901, provided for the widening and deepening to a navigable depth of 20 feet of the existing channels, for new channels in Allouez Bay and St. Louis River, for extensive turning and anchorage basins of a navigable depth of 20 feet at the junctions of two or more channels, for widening the Duluth Canal, and for rebuilding the piers at the Duluth Canal and Wisconsin Entrance and finishing them off with concrete superstructures built of monolithic blocks.

The estimated cost of the work was $3,130,553, but this referred only to the deepening of the channels and basins by dredging. This has been done at much less than the estimated cost, permitting the purchase of lands to the extent of $106,561.19, the rebuilding of the Duluth Canal piers at a cost of over $650,000, including price of land, and leaving a balance of about $275,000 toward the rebuilding of the piers at the Wisconsin Entrance, under construction from 1903 to 1906.

The existing project has been modified as follows:

First: By project adopted by act of June 13, 1902, for revetment piers at Superior Entry, Wis., with all-concrete construction, increasing the original estimate by $650,000.

Second: By the act of March 2, 1907, in accordance with the report submitted in House Document No. 82, Fifty-ninth Congress, second session, which provides for excavation of the lake approach to the Duluth Entrance to 30 feet for a width of 300 feet, at a cost of $10,000, and the following work at Superior Entry: (a) Building a concrete revetment pier on the north side of entrance, similar to one already built in 1904, on the south side under the project before present modification, these two revetments 500 feet apart and terminating near the lake shore of Wisconsin Point; (b) building two converging breakwaters from the shore out to the 30-foot depth, with an opening of 600 feet on line with the axis of the inner entrance, to be of rubble mound construction, terminating in a crib and concrete pier at outer end and a pile pier at inner end; (c) dredging between the breakwaters to form a channel 600 feet wide and 30 feet deep, and further dredging to form a stilling basin; (d) dredging channel between revetments to a depth of 24 feet; (e) protecting the shore line by riprap; and (f) widening the Superior front channel inside the harbor; estimated to cost $1,703,000. The said act also provided for additional dredging near the draw span of the Northern Pacific Railroad bridge, at an estimated cost of $55,500.

Third: By the act of May 28, 1908, which provided for the expenditure of moneys heretofore appropriated for the harbor for dredging inside the Duluth Entrance, in accordance with a report in House Document No. 221, Sixtieth Congress, first session. This report recommended the enlargement by about 209 acres of the anchorage area of the Duluth Basin, by dredging to a depth of 22 feet, low-water datum, an estimated amount of 4,590,000 yards, at a cost of $550,800, which estimate was later increased to 5,600,000 yards and a cost of $672,000, in order to give an available depth of 22 feet at all times.

These several modifications have a combined estimated cost of $3,090,500, and together with the first estimate of $3,130,553 make a total estimated cost of $6,221,053 for the present project and its modifications.

The existing project, with modifications, therefore provides for dredging channels to a navigable depth of 20 feet, for extensive turning and anchorage basins of a navigable depth of 20 feet at the junctions of two or more channels, for the enlargement by about 209 acres of the anchorage area of the Duluth Basin by dredging to a depth of 22 feet, low-water datum, for widening the Duluth Canal, for rebuilding its piers and finishing them off with concrete superstructures built of monolithic blocks, for excavation of the lake approach to the Duluth Entrance to 30 feet for a width of 300 feet, and the following work at the Superior Entry: (*a*) Building two concrete revetment piers, one on each side of the entrance, 500 feet apart and terminating near the lake shore of Wisconsin Point; (*b*) building two converging breakwaters from the shore out to the 30-foot depth, with an opening of 600 feet on line with the axis of the inner entrance, to be of rubble mound construction, terminating in a crib and concrete pier at outer end and a pile pier at inner end; (*c*) dredging between the breakwaters to form a channel 600 feet wide and 30 feet deep, and further dredging to form a stilling basin; (*d*) dredging channel between revetments to a depth of 24 feet; (*e*) protecting the shore line by riprap; and (*f*) widening the Superior front channel inside the harbor. Total estimated cost, $6,221,053.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Superior, Wis.						
					1866 [1]	88
					1867 [1]	559
					1870 [1]	89
Observation on currents and water levels.					1872 [1]	106
Dike in Superior Bay					1873 [1]	141, 137, 148, 173
General improvement					1879 [1]	1469, 1471
Superior Bay and St. Louis Bay, Wis.						
General plan for harbor improvement.[2]	Senate	153	Forty-sixth	Second	1880	1884, 1889
Do.[2]	House	82	do	Third	1881	2026
Do.[2]	do	204	Forty-eighth	Second	1885	1959
Allouez Bay, Wis.						
Harbor lines and general improvement.[1]	House	40	Fifty-first	Second	1891	2512
Do.[2]	do	49	Fifty-second	do	1893	2692, 2696
General improvement [2]	do	172	Fifty-third	Third	1895	2585
Modification of harbor lines					1897	2647
Minnesota Point.						
Sand fences [2]	House	81	Fifty-first	First	1890	2206

[1] No map.

[2] Contains map.

References to examination or survey reports and maps or plans not in project documents—Continued.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Duluth Harbor.						
					1869 [1]	29
General plan for harbor, including breakwater in lake.					1870 [1]	[illegible], 170
Duluth Canal and Harbor in general					1873 [1]	145
					1879 [1]	1470
General plan for harbor improvement.[2]	Senate	153	Forty-sixth	Second	1880	1875, 1884
Do.[2]	House	82	do	Third	1881	[illegible]
					1882 [1]	2102
					1885 [2]	1944
St. Louis River [2]	House	204	Forty-eighth	Second	1885	1959
General improvement [2]					1886	1852
Do.[2]					1887 [2]	1944
Do.[2]	House	217	Fifty-first	First	1890	2311, 2490
Harbor lines					1891 [2]	2536
St. Louis River [2]	House	58	Fifty-second	First	1892	2148
General improvement [2]	do	122	do	Second	1893	2004
Duluth Canal lands [2]					1898	[illegible]
Duluth-Superior Harbor in general.						
Modification of harbor lines (Superior).[1]					1894	[illegible]
Deepening harbors [2]	House	50	Fifty-third	Third	1895	2588, 2579
Sketches of piers, concrete molds, etc.[2]					1898	2226
Do.[2]					1899	2702
Harbor lines [1]					1900	3642
Do.[1]					1902	1828
Harbor map [2]					1903	1808
St. Louis River [1]	House	215	Fifty-eighth	Second	1904	2808
Modification of harbor lines at Government boat yard [1]					1906	2011
Superior entry and lake approach, Duluth, canal.[2]	House	82	Fifty-ninth	Second	1907	608, 1833
Duluth Harbor Basin [2]	do	221	Sixtieth	First	1908	648
Superior entry improvements					1908 [2]	1961
Anchorage area, Superior entry [1]	House	817	Sixty-first	Second	1910	751
St. Louis River above New Duluth [1]	do	820	do	do	1910	757
Do.[1]	Senate	489	do	do		
Do.[1]	House	29	Sixty-second	First	1911	814
Lake Superior and Mississippi River Canal.						
					1895 [1]	[illegible]
	House	330	Fifty-fourth	First	1898 [2]	[illegible]
	do	69	Fifty-sixth	do	1900 [1]	3613
By way St. Croix River	do	804	Sixty-first	Second	1910 [2]	767

[1] No map.

[2] Contains map.

Operations during the fiscal year ending June 30, 1912, include the following:

Duluth Harbor Basin.—Work on the extension of this basin, authorized by act of May 28, 1908, was continued under a contract which is now in force. The amount dredged during the fiscal year was 1,382,511 yards, at 9 cents, making a contract cost of $124,425.99. This dredged an area of about 53 acres, deepening it from the original depth of 7 feet to 22 feet, and further increased the area about 12 acres by bringing in the adjacent portion of Rice Point Channel, making an increase of 65 acres in the size of the basin. The present contract is for two and two-thirds million yards. It commenced October 5, 1910, and will be completed on or before October 31, 1912. It is expected that it will increase the basin by 127 acres and make a total area of 376 acres in the basin. This work is for the extension of benefits to navigation.

After the completion of the present contract there may remain to complete the project for harbor extension the dredging of about 39 acres, or 1,059,000 yards, of excavation, and the total resulting capacity of the basin will be not far from 439 acres. The present contract is 86 per cent completed, and entire project for harbor extension is 74 per cent completed.

Removal of shoals.—Dredging for the removal of shoals from channels and basins in the harbor, where the depth had decreased to less than 20 feet, was executed to the extent of 88,445 yards, at 17 cents, making a contract cost of $15,035.65 during the fiscal year. This work was for maintenance of existing improvements.

Superior entry improvement.—During the fiscal year operations continued on the project of March 2, 1907. Work was done on the breakwaters, on dredging the entrance channel, stilling basin, and the north side of the inner channel, on removing old piers, and other items, the details of which may be seen in Appendix I I 3 of this report. Some of the work was by contract and some executed with United States plant and hired labor. The expenditure for the year was $211,088. This project is estimated as 83 per cent completed. This work is for the extension of benefits to navigation.

New vessel.—A patrol launch 60 feet long was built for the use of the harbor inspector in enforcing the harbor rules and regulations, at a contract cost of $13,970.80.

The work done under the existing project up to the close of the past fiscal year may be summarized as follows:

The dredging of channels and basins, which was in operation for six seasons under continuous contract and completed in 1902, removed 21,697,243 yards of material, and gave 17 miles of dredged channels from 120 to 600 feet in width, and basins for anchorage and for turning at the junctions of channels and in the vicinity of bridges of an aggregate area of about 360 acres, all of a depth of 20 feet or more at low water. Since then the enlargement of the basins has increased the aggregate area to more than 584 acres.[1]

The lake approach to the Duluth Canal has been deepened to 30 feet or more for a width of 330 feet. The lake approach to the Superior entry has been deepened to 30 feet or more for a width of 350 feet. Channels have been widened in St. Louis Bay to adapt them to the reconstructed spans of the Northern Pacific bridge, which have recently been enlarged and altered in position.

The East Gate Basin has been enlarged, giving increased facilities for the passage of vessels through the Duluth-Superior bridge and for vessels passing from the Rice Point Channel to the Superior Front Channel.

The Duluth Harbor Basin is being extended in order to provide additional and much needed anchorage facilities, and about 74 per cent of the projected amount of this work has been accomplished. The Government harbor line in front of Minnesota Point has been moved inshore to a distance of 750 feet by the Secretary of War in order to provide the room necessary for this extension of the basin.

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[1] This includes areas of adjacent channels which become part of the basins by reason of the enlargements.

The maintenance of these channels has been kept up by the removal of shoals, and a maximum draft of 20 feet at mean low water could be carried through any and all of them on June 30, 1912. The usual variation of water level extends from about 0 to +1 foot above low-water datum. This reference plane is a mean low stage of the lake, and is referred to permanent bench marks. The head of navigation is at the foot of the rapids just above the village of Fond du Lac, on the St. Louis River, about 20 miles from Lake Superior.

All the land necessary for the widening of the Duluth Canal has been acquired by deed of gift, purchase, or condemnation, at a cost of $53,919.05.

The land needed for the improvement at the Wisconsin Entrance, the mouth of the Nemadji River, and a marshy island in the St. Louis River was obtained by condemnation proceedings, at a cost of $42,795.94.

A small parcel of land at the end of Grassy Point and certain lands in Spirit Lake were purchased at a cost of $3,146.20.

A site for a boat yard on Minnesota Point, near the Duluth Canal, was acquired by purchase and condemnation, at a total cost of $7,200, and the vacation of a portion of a street was effected through the city authorities, which was found necessary in order to carry out a proper system of improvement. This property has now been improved by building a bulkhead and a landing pier, dredging a slip, filling the yard with sand, moving the four Government buildings which had been occupying leased ground at the foot of Seventh Avenue, and by fencing in, paving a roadway, and surfacing and seeding for grass. The cost of this improvement has been about $17,750.

New piers were built for the Duluth Canal. These piers have been equipped with 67 iron lamp-posts, and the city furnishes the electric current for lighting the same during the season of passenger travel by lake.

Concrete walls inclosing the Government lands at the Duluth Canal were built and the tracts filled to grade, requiring the deposit of about 50,000 cubic yards of material.

The construction of an engineer building on the Government land north of the canal for offices and a watchman's house has been completed, at a cost of about $25,000. On May 1, 1906, the rented office rooms were given up and the new building occupied. It is a substantial building, conveniently near the harbor and United States vessel yard, and well adapted to office purposes. The parking of the canal grounds and the construction of additional concrete walls to protect the grounds from flooding by storms have been completed.

At the Wisconsin Entrance (known also as the Superior Entry) the replacing of the old piers by new ones of concrete construction was begun in 1903. About one-half of the south pier was completed in 1904. A description of the method of construction may be seen in Appendix A A A, page 3779, of the Annual Report of the Chief of Engineers for 1904. During the following two years but little was accomplished in the way of construction at the Superior Entry on account of the destruction of protective works by storms. Work on the concrete piers was ordered discontinued by the Chief of Engineers

August 21, 1906, pending the consideration of a report by a board of engineers.

Work on the modified project at the Wisconsin Entrance in accordance with the act of March 2, 1907, was commenced in the spring of 1907, and has been in progress since that time. The results accomplished are stated in detail elsewhere in this report and in the annual reports for previous years. Up to June 30, 1912, about 83 per cent of this projected improvement has been accomplished.

The amount expended on the existing project to the close of the fiscal year ending June 30, 1912, exclusive of outstanding liabilities, was $5,321,558.02, of which about $606,030 was expended for maintenance.

The lake commerce of this port, Duluth-Superior, during the last season of navigation (1911) amounted to 30,672,846 short tons, valued at $236,056,373, and from the beginning of improvements by the Government in 1867 to 1911, inclusive, the vessel freight entering and departing has amounted to 365,865,859 short tons, valued at $3,885,394,224.

It is believed that the tonnage of Duluth-Superior Harbor is now exceeded by that of but one port in the United States—New York.

The vessel freight of Duluth-Superior Harbor for 1911 was 57 per cent of the amount which passed the Sault locks the same year.

For a comparison between the cost of improvements and the volume of commerce it may be stated that the total amount of money expended by the Government on the improvement of this harbor from the commencement of work in 1867 up to June 30, 1912, is $6,869,741.02.[1] The vessel freight received and shipped at this port during the same period was 365,865,859 short tons, and its market value was $3,885,394,224. From this it appears that the cost of Government improvements has been about one-sixth of 1 per cent of the value of the freight transported.

The annual expense of Government operations at this harbor, consisting of maintenance, interest on the total cost of improvements to date, and depreciation, is approximately $326,360. This annual expense, when compared with the commerce of the harbor, amounts to about 1 cent for each ton of the vessel freight for the year 1911. Compared with the value of the commerce the annual expense amounts to about one-seventh of 1 per cent of the value of the vessel freight for the same year. For a further comparison it appears that the annual expense is only about one-half of 1 per cent of the saving in cost of transportation by water as compared with rail rates on the same freight for the year 1911. Further details may be seen in Table 4, Appendix II 3 of this report.

Effect of project on freight rates: It may not be possible to give exact figures showing the effect of the improvements of this harbor on freight rates, but the following statements have a bearing on the question:

The average rate on freight passing through St. Marys Falls Canals in 1911 was 0.67 (two-thirds of 1 mill) per mile per ton, and the average haul was 826 miles, as shown by the official records. If the same freight had been carried by rail the rate would probably have been as much as 3 mills per ton-mile, making a difference of 2.33 mills per ton-mile.

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[1] It should be stated that the figures given in this report for expenditures for improvements, maintenance, interest, and depreciation, and in Tables 2 and 4 of Appendix II 3, relate only to harbor work by the United States Engineer Department, and do not include expenditures for lighthouses and channel marks, nor the Life-Saving Service, weather signals, Lake Survey charts and bulletins, or the United States hydrographic charts and other information for mariners; all of which are aids to navigation, as well as are the improvements in the form of piers, breakwaters, and dredged channels, but do not fall within the scope of the present report.

Assuming this difference to apply to freight for Duluth-Superior Harbor, and that the average haul is 826 miles, the saving in cost of transportation by water would be $1.92 per ton, and for the 30,672,846 tons received and shipped at this harbor in 1911, the saving in cost amounts to about $58,891,864 for that one year.

The saving in cost of this large sum has, of course, been made possible by the Government improvements, not only at this harbor, but at St. Marys River and at other points between here and the Lake Erie ports, and it is not known just how much of the above saving should be credited to the Duluth-Superior improvements. It is evident, however, that with any reasonable proportion of such saving in transportation accredited to the improvements at this harbor, which form an essential and necessary part of the whole waterway, the cost of such improvements must be only a small fraction of the saving in freight rates effected thereby.[1]

The foregoing saving to shippers is based upon a comparison of existing rates of transportation by water and rail. In addition to this it should be said that the rail rates are reduced or kept down by the competition of the waterway, and in that way a further saving in transportation is effected. The two modes of transportation having developed contemporaneously during the last half century, it would be hard to say what the railroad rates would be if the Great Lakes waterway with its Government improvements did not exist, but there is hardly room for doubt that they would be materially higher.

It is proposed to apply the amount required for expenditure in the fiscal year ending June 30, 1914, in completing the work covered by adopted projects, and for maintenance, as stated more in detail in Appendix I I 3.

The above is in part for extension of benefits to navigation and in part to make the existing improvements available.

With regard to the maintenance of improvements in this harbor, it is believed that this could be advantageously provided for by an annual allotment.

With 49 miles of harbor frontage, 17 miles of 20-foot channels, and the handling of over 30,000,000 tons of freight in the past year, there is necessity for the closest inspection, by a special patrol provided with a tug, to prevent injurious deposits, encroachments of wharves and other private structures, the enforcement of rules regarding the rafting of logs, the anchorage of vessels, the opening of draws, and the care of United States property. These, with the discovery and removal of shoals, repairs to Government piers, the care of parks, and the collection of complete and reliable commercial statistics, which has already proven of great value, it is thought could best be cared for by congressional action authorizing allotments or appropriations to be made on estimates submitted.

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[1] A similar saving in freight rates applies to other harbors in the Duluth district which have railroad connections and where harbor improvements executed by the Government (or in part at private cost) have opened up these harbors to interlake navigation and commerce. The above-named amount of saving in cost of transportation, $1.92 per ton, will be considered as also applying approximately to the harbors of Agate Bay, Ashland, Ontonagon, Marquette, Marquette Bay, and the local harbors of the Keweenaw waterway, subject to more or less error, according to different local conditions, such as the class of freight, its destination, number of competing railroads, facility of handling freight by boat and by rail, etc. (See Table 4, Appendix II 3 of this report.)

July 1, 1911, balance unexpended		$681,626.62
Miscellaneous receipts		8,352.92
		689,979.54
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$346,516.87	
For maintenance of improvement	50,000.00	
		396,516.87
July 1, 1912, balance unexpended		293,462.67
July 1, 1912, outstanding liabilities		27,275.00
July 1, 1912, balance available		266,187.67
Amount appropriated by river and harbor act approved July 25, 1912		150,000.00
Amount available for fiscal year ending June 30, 1913		416,187.67
July 1, 1912, amount covered by uncompleted contracts		115,850.00
Amount (estimated) required to be appropriated for completion of existing project		[1] 589,999.20
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 375,280.00

(See Appendix I I 3.)

4. *Harbor at Port Wing, Wis.*—Situated on the south shore of Lake Superior, 34 miles east of Duluth. The harbor consists of the improved mouth of Flag River, having an entrance channel 200 feet wide between the Government piers and a turning slip just within the entrance. The river proper has been improved at private expense.

Before improvement the depth at entrance was small and variable. It was 2 or 3 feet at times, and at other times the entrance was closed entirely.

Previous to Government operations the harbor had been improved by private parties to some extent. The entrance had been jettied, but imperfectly and with only partial success, and dredging was necessary every spring for removing a sand bar. Within the harbor much dredging had been done to accommodate the lumber business.

In accordance with the provisions of the act of Congress approved March 3, 1899, a report upon a survey of this harbor with a project for its improvement was submitted on November 20, 1899.

This project provided for the construction of two parallel piers of piling, filled in with slabs and topped with large rock. These piers were to be located 200 feet apart and to be 800 feet and 825 feet long, respectively. A channel 150 feet wide and 15 feet deep was to be dredged between the piers and for 500 feet along the slough. The estimated cost of the improvement was $44,992, increased in 1908 to $56,539 on account of underestimate for dredging in the original estimate.

By act of Congress approved June 13, 1902, the project was adopted; the village of Port Wing conveyed to the United States without cost 7 acres of land at the harbor entrance needed for the improvement, and the work of improvement was commenced in 1903.

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[1] Exclusive of amount available for fiscal year 1913.

The existing project with modifications is for the construction of two parallel piers of piling, filled in with slabs and topped with large rock. These piers were to be located 200 feet apart and to be 800 feet and 825 feet long, respectively. A channel 150 feet wide and 15 feet deep was to be dredged between the piers and for 500 feet along the slough. Estimated cost $56,539.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Flag Lake and River [1]	House	65	Fifty-third	Third	1895	2580
Do.[1]	do	113	Fifty-fourth	Second	1897	2643
Mouth of Flag River [2]	do	114	Fifty-sixth	First	1900	3630
Harbor map [2]					1908	1810

[1] No map.

[2] Contains map.

The amount expended on this work to the close of the fiscal year ending June 30, 1912, exclusive of outstanding liabilities, was $56,776.24, of which $13,219.79 was for maintenance.

No work was done during the year. There was much less than the usual amount of shoaling, and the project depth of 15 feet remained throughout the greater portion of the Government channel.

The following results have been accomplished: The two entrance piers built, with lengths of 800 and 601 feet, respectively; 45 feet of pile revetment at the inner end of the east pier; dredging which gave an entrance channel 15 feet deep at low water, 100 feet wide, and extending from deep water in the lake through to a distance of 200 feet inside of the inner end of the east pier; a portion of the turning slip, extending 175 feet to the east, past the inner end of the east pier, with a width of 150 feet and a depth of 15 feet; a pile revetment 100 feet long at the inner end of the west pier, and maintenance of improvement by dredging of shoals and repairs to the piers.

A maximum draft of 15 feet can be carried June 30, 1912, at mean low water over the shoalest portion under improvement. The usual variation of water level extends from mean low water (low-water datum) to 1 foot above datum. This reference plane is a mean low stage of the lake, and is referred to bench marks.

Private dredging extended a navigable channel to a distance of about 2,500 feet southerly from the entrance, and this improvement marked the limit of navigation on Flag River. This stretch of river has been redredged from time to time by private enterprise, and the lower portion has an available depth of probably 14 feet for a short distance from the entrance, while the upper portion is now badly shoaled.

There remains to complete the approved project, dredging to increase the width of the entrance channel to 150 feet, the extension of the turning slip to a total distance of 500 feet from the east pier, and width of 150 feet, and the construction of 155 linear feet of pile revetment along the turning slip.

The proportion of the approved project accomplished up to June 30, 1912, is 80 per cent.

The vessel freight of this harbor was 64 arrivals and departures, with 31,127 short tons, valued at $305,000, in 1901, and 98 arrivals and departures, with 12,419 short tons, valued at $313,504, in 1911.

The freight tonnage in 1911 was 51 per cent less than that for the previous year.

The total freight of this port for the nine years, 1903 to 1911, inclusive, since the date of commencement of Government improvements, was 366,607 tons of 2,000 pounds.

The total expenditures by the Government for this harbor to date are only 1⅛ per cent of the value of the vessel freight received and shipped during the period covered by these expenditures.

The annual expense of Government improvements at this harbor, consisting of maintenance, interest, and depreciation, is approximately $3,935. This amounts to 32 cents per ton of the vessel freight for 1911 and to 1¼ per cent of the value of this freight. Further details may be seen in Table 4, Appendix I I 4, of this report.

Effect of project on freight rates: This harbor has only water transportation for the movement of its freight, and for this reason no comparison can be made with freight charges by railroad.

The construction of a harbor here has been an essential factor in the development of the commerce of Port Wing. There was no commerce to mention previous to these improvements. In 1907 it amounted to nearly a million dollars.

It is proposed to expend the sum required for expenditure in the year ending June 30, 1914, in the following manner:

For continuing improvement (dredging and revetments)	[1]5,000
For maintenance (repairs, removing shoals, etc.)	5,000
	10,000

The work proposed is for the purpose of making the improvement available.

July 1, 1911, balance unexpended		$7,664.75
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$2,254.50	
For maintenance of improvement	2,194.49	
		4,448.99
July 1, 1912, balance unexpended		3,215.76
Amount appropriated by river and harbor act approved July 25, 1912		10,000.00
Amount available for fiscal year ending June 30, 1913		13,215.76
Amount (estimated) required to be appropriated for completion of existing project		[1]7,237.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1]10,000.00

(See Appendix I I 4.)

5. Harbor at Ashland, Wis.—Ashland Harbor is located at the head of Chequamegon Bay, on the south shore of Lake Superior, at a distance of 95 miles by water from Duluth. The bay is about 5 by 12 miles in size, the greater portion having ample depth for navigation, but a considerable distance along the harbor front was shallow and required dredging. This harbor was originally subject to more or less disturbance from waves generated within the bay by storms.

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[1] Exclusive of amount available for fiscal year 1913.

Congress by act of August 5, 1886, provided for improvement of this harbor without any definite project (House Doc. 89, 48th Cong., 2d sess.).

The original project, approved December 7, 1888, and modified February 9, 1889, was for the construction of a pile, slab, and rock breakwater 8,000 feet long, and for dredging a channel in front of the wharves of the city.

The original estimates of cost were, for dredging, $65,540; for breakwater, $165,760.

The act of March 3, 1899, added to this project by authorizing an extension of the breakwater to the shore, thus requiring the ultimate construction of 10,200 feet of breakwater. The emergency river and harbor act of June 6, 1900, provided that the appropriation already made should be expended in building a shore spur 4,700 feet in length from a point 2,600 feet east of the prolongation of the present breakwater and parallel thereto. This again changed the project, adding greatly to the total length of breakwater to be constructed and largely to the total expense.

The existing project with modifications therefore is for constructing a pile, slab, and rock breakwater 8,000 feet long; for building a second breakwater 4,700 feet in length as a shore spur, located 2,600 feet east of the present breakwater and parallel thereto; and for dredging a channel in front of the wharves of the city.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session	Year.	Page.
General improvement [1]	Senate	82	Forty-sixth	Second	1880	[illegible]
Do.[2]	House	89	Forty-eighth	do	1885 [2]	2010
Do.[2]					1886 [2]	1674
Do.[2]					1887 [2]	1957-1967
Harbor lines [2]					1896 [2]	2455
Harbor map [2]					1908 [2]	1812
General improvement [2]	House	536	Sixty-first	Second	1910 [2] 1911 [2]	745 2276

[1] No map. [2] Contains map.

The total amount expended on this project and its modifications up to the close of the fiscal year ending June 30, 1912, not including outstanding liabilities, is $521,352.07, of which amount $294,357.76 has been applied to the maintenance of the improvement.

Under this project and its modifications there have been constructed 7,454 feet of breakwater on the original line and 842 feet on the line fixed by the act of June 6, 1900.

Of the 7,454 feet on the original line 91 feet is detached and uncompleted work near shore and 7,363 feet is completed breakwater in one piece.

This breakwater, as originally built of piles, slabs, and rock ballast, was a frail structure and required large expenditures for maintenance.

The work of revetting this structure with sandstone riprap so as to form a permanent rubble mound breakwater, with the old structure for a hearting, was begun May, 1903, and was completed for the entire length of 7,363 feet on October 20, 1909. A diagram showing the method of reenforcing the breakwater may be seen in the Annual Report of the Chief of Engineers for 1905, page 1992.

Operations for the fiscal year consisted in dredging to widen the Government channel and remove shoals to the amount of 122,107 yards and contract cost of $14,157, giving a channel 20 feet deep at low water and 200 feet wide for a length of 5,760 feet, and in commencing the rubble mound extension to the breakwater for making a total length of 8,000 feet. On this extension there were placed 4,378 tons of rock at a contract cost of $5,428, building the core for the mound to a length of 103 feet. The dredgings from the channel during the year were deposited on the line of the proposed breakwater extension to form an embankment on which to place the rubble mound.

The dredged channel is in front of the westerly portion of the city. The easterly front has a natural depth of 18 to 20 feet at low water and is sufficient for the present needs of commerce.

The breakwater gives a protected area of about 1,600 acres and affords safe anchorage and dockage for a distance of 3 miles along the city front.

The usual variation of level of the water surface is from about 0 to +1 foot, referred to mean low water, this plane of reference being a mean low-water level. It is referred to permanent bench marks.

The proportion of the approved project accomplished up to June 30, 1912, is as follows:

Breakwaters: 93 per cent completed of the original project of 8,000 feet; 73 per cent of the 8,000 feet and the shore extension to same; 55 per cent if we take into account the 8,000 feet with its shore extension and also the detached breakwater half a mile to the east.

Percentage of channels completed is indefinite.

The commerce of this port carried by vessels consists principally of iron ore and lumber exported, and coal, mineral oil, and general merchandise imported. (With the commerce of Ashland are included the towns of Washburn and Bayfield, unless otherwise stated.)

The commerce has increased during the 24 years the harbor has been under improvement by the United States from 892 arrivals and clearances, with cargo tonnage of 1,400,000 short tons in 1887, to 1,758 arrivals and clearances, with cargo tonnage of 3,621,279 short tons, valued at $13,240,067, in 1911. The total commerce from 1887 to 1911, inclusive, is estimated at 88,318,877 short tons, valued at $579,437,930, exclusive of logs towed in rafts.

The total expenditures by the Government for this harbor to date are about one-eleventh of 1 per cent of the value of the vessel freight received and shipped during the period covered by these expenditures.

The annual expense of Government improvements at this harbor, consisting of maintenance, interest, and depreciation, is approximately $24,941, and amounts to $0.007 per ton of the vessel freight for 1911, to one-sixth of 1 per cent of the value of this freight, and to less than one-half of 1 per cent of the saving in the cost of transportation on the same freight by water as compared with rail rates.

Further details of these comparisons may be seen in table 4, Appendix I I 5, of this report.

Effect of project on freight rates: The estimated saving in cost of transportation by water over that by rail is $1.92 per ton, which is $6,327,938 for the business of this port in 1911.

The proposed extension of the breakwater for a distance of 637 feet is described, with estimate of cost, in the Annual Report of the Chief of Engineers for 1910, page 745, fourth paragraph. Present funds, appropriated 1911, will build the sandstone core to the rubble mound of this extension and the concrete superstructure to the pierhead.

The amount recommended for expenditure in fiscal year ending June 30, 1914, will be applied to continuing the work of refilling with granite rubble portions of the breakwater revetted with sandstone under the earlier contracts (1903 and later), where settlement and wear of the sandstone has occurred. The necessity of this refilling is stated in the Annual Reports for 1908, page 1917, third paragraph, and for 1909, page 1918, near bottom, and dredging shoals. The improvement is for channel extension, etc., and the work proposed is for the purpose of making the improvement available.

July 1, 1911, balance unexpended		$58,274.96
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$28,977.03	
For maintenance of improvement	1,150.00	
		30,127.03
July 1, 1912, balance unexpended		28,147.93
Amount appropriated by river and harbor act approved July 25, 1912		20,000.00
Amount available for fiscal year ending June 30, 1913		48,147.93
July 1, 1912, amount covered by uncompleted contracts		20,155.00
Amount (estimated) required to be appropriated for completion of existing project		[1] 258,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 40,000.00

(See Appendix I I 5.)

6. Harbor at Ontonagon, Mich.[2]—Situated on the south shore of Lake Superior, 144 miles east of Duluth, this harbor is formed by the improvement of the mouth of the river of the same name. About one-half mile of the river is used for commercial purposes. Two parallel timber piers, one-half mile long and 250 feet apart, with dredging between them to a depth of 15 feet, form the entrance. The natural entrance had but 6 or 7 feet depth[3] in 1867, at which time Congress, by making an appropriation in the act of March 2, 1867, provided for the improvement of this harbor, and the project for securing 12 feet depth by building parallel piers on either side of the mouth, extending to the 18-foot curve of depth in Lake Superior, and dredging a channel between the piers was adopted; estimated cost, $363,770. The west pier was built to a length of 2,675 feet and the east pier to a length of 2,315 feet. This brought the outer end of the west pier very nearly to the 18-foot curve of depth, as proposed.

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[1] Exclusive of amount available for fiscal year 1913.

[2] The records of the Duluth office show very little of the early history of this harbor.

[3] The datum plane for these depths is not known, but the prevailing stage of lake was undoubtedly used.

The original project was completed in 1889, and since then up to 1910 expenditures have been only for keeping a 12-foot channel open by dredging and for the repairs to the piers.

The amount expended on original project is $398,017.98, of which sum $113,216.74 has been spent for maintenance of the improvements.

Congress by act of June 25, 1910, authorized further improvement of this harbor by the so-called "smaller plan" reported in House Document No. 602, Sixty-first Congress, second session, which provides for a channel 150 feet wide and 17 feet deep at low water in the lake, 100 feet wide and 15 feet deep between the piers, and two short channels 75 feet wide and 15 feet deep leading from the inner end of the piers to the nearest end of the principal wharves on each side of the harbor, at an estimated cost of $15,400, with $8,000 annually for maintenance and an additional $1,000 annually for the maintenance of the piers.

The amount expended on the last-named project to June 30, 1912, is $9,560.10, of which $5,300.10 was for maintenance.

The existing project with modifications provides for a channel 150 feet wide and 17 feet deep at low water in the lake, 100 feet wide and 15 feet deep between the piers, and two short channels 75 feet wide and 15 feet deep leading from the inner end of the piers to the nearest end of the principal wharves on each side of the harbor, these depths to be secured by building parallel piers on either side of the mouth, extending to the 18-foot depth in Lake Superior and by dredging. Estimated cost, $379,170.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
General improvement [1]	House	80	Thirty-ninth	Second	1867	17
Do					1876 [2]	822
					1888 [2]	1820
					1893 [1]	2677
					1894 [1]	2027
					1899 [2]	456
Harbor map					1908 [2]	1814
	House	444	Sixtieth	First	1908 [1]	647
General improvement [2]	do	602	Sixty-first	Second	1910	747

[1] No map.

[2] Contains map.

Operations for the fiscal year consisted in dredging the entrance channels for improvement to the extent of 21,074 yards at 11½ cents, $2,423.51, exclusive of administration; 16,820 yards for maintenance by the removal of shoals, June, 1912, at 22 cents, $3,700.40; and repairing piers, $2,745, making a total of $8,865.

The improvement contemplated under the last modification of the project authorized June 25, 1910, is about 90 per cent completed, and for about one-third of the estimated cost. This difference is owing to the absence of expected shoaling (see H. R. Doc. 602, 61st Cong., 2d sess., p. 14) and to an abnormally low price for dredging (11 cents) under sharp competition.

The proportion of the entire approved project accomplished up to June 30, 1912, is more than 99 per cent. But little remains now except maintenance.

The maximum draft that can be carried June 30, 1912, at low-water datum over the shoalest part of the locality under improvement is about 8 feet. Dredging in progress, however, has given an available depth of 15 to 17 feet for a partial width of the projected channel. The datum plane to which depths are referred at this harbor and for the entire Duluth district is low-water datum, which is a mean low-water level. This plane of reference is fixed by permanent bench marks. The usual variation of water level extends from 0 to +1 foot above low-water datum.

In 1867 there were 449 arrivals and departures, with 5,000 short tons of cargo, and in 1911 there were 404 arrivals and departures, with 21,266 short tons of cargo, valued at $245,956.

The commerce of this port since the commencement of operations by the United States is estimated at 1,028,441 short tons, valued at $49,845,487. (See footnote (4) to Table 2, Appendix I I, of this report.)

The amount of freight received and shipped in 1911 was 3 per cent less than in 1910, and in value of freight it was 22 per cent less than in 1910.

The total expenditures by the Government for this harbor to date are about four-fifths of 1 per cent of the value of the vessel freight received and shipped during the period covered by these expenditures.

The annual expense of Government operations at this harbor, consisting of maintenance, interest, and depreciation, is approximately $19,920. This amounts to 94 cents per ton of vessel freight for the year 1911 and to 8 per cent of the value of this freight, and is 49 per cent of the saving in the cost of transportation on this freight by water as compared with rail rates. Details of these comparisons may be seen in Table 4, Appendix I I 6.

Effect of project on freight rates: The estimated saving in cost of transportation by water over that by rail is $1.92 per ton, or $40,831 for the lake commerce of this port in 1911. As the former condition of the river was unsuited to navigation, this saving in freight rates may be considered as effected by the United States improvements.

The amount recommended for expenditure in fiscal year ending June 30, 1914, will be applied to the removal of shoals, repairs to piers, and to general maintenance, the work proposed being necessary to make the improvement available.

July 1, 1911, balance unexpended		$25,008.23
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$4,260.00	
For maintenance of improvement	4,798.31	
		9,058.31
July 1, 1912, balance unexpended		15,949.92

July 1, 1912, amount covered by uncompleted contracts	$8,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 9,000.00

(See Appendix I I 6.)

7. *Keweenaw Waterway, Mich.*—This is a navigable channel, 25 miles long, partly natural and partly artificial, across Keweenaw Point, a peninsula on the south shore of Lake Superior lying about midway between Sault Ste. Marie and Duluth. This work was formerly reported on as the Portage Lake and Lake Superior Canals, across Keweenaw Point, Mich.

In accordance with the provisions of the river and harbor act of September 19, 1890, the United States purchased and assumed the charge and care of these canals on August 3, 1891.

At the time of the purchase by the United States there was a very poor 13-foot navigation; the channel was narrow and crooked, with many sharp bends; it was poorly marked and lighted; the entrance piers were in a very bad condition; the revetments were decayed or entirely gone; and there was a tax on the commerce through the canals in the shape of a tonnage charge.

The original project based on report of a board of engineers, dated December 22, 1886, adopted January 24, 1887, and printed in House Document No. 105, Forty-ninth Congress, second session (see Chief of Engineers Report for 1887) was—

1. For a 16-foot channel of 70 feet bottom width from bay to lake.
2. A renewal of the canal revetments.
3. A reconstruction of the piers at the Lake Superior entrance and their extension to 30 feet depth of water.
4. The extension of the pier at the Keweenaw entrance to a 20-foot depth of water.
5. At the proper time to increase the channel depth to 20 feet, with a corresponding width, which should not be less than 120 feet.

The sum expended in the purchase of the canals, lands, etc., and on items 1 and 2 of the original project was $850,000.

The act of June 3, 1896, authorized continuing contracts to complete items 1, 2, 3, and 4 of the above project to the amount of $1,115,000.

By modification approved March 15, 1898, the width and depth were to be increased to 120 feet and 20 feet, respectively, as originally contemplated.

The entire project, including the modification for 20-foot depth and 120-foot width, was completed at a cost of only $45,000 in excess of the estimate for the 16-foot depth, or $715,000 less than the estimated cost of the larger project.

The total amount expended on the original project and its modifications up to the close of the fiscal year ending June 30, 1912, not including outstanding liabilities, was $1,338,654.89, of which about $39,223.50 was expended for maintenance.

The existing project for "Waterway across Keweenaw Point, Mich.," adopted by the river and harbor act of June 25, 1910, in accordance with report printed in House Document No. 325, Sixtieth Congress, first session, contemplates the excavation of a basin, with mooring pier, just within the eastern entrance to the canal, and involves the acquisition of a considerable tract of land in addition to that pertaining to the present canal property, at an estimated cost of $210,000, subject to the condition that the land needed shall be acquired at reasonable cost, either by purchase or condemnation.

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[1] Exclusive of the balance unexpended July 1, 1912.

It has been found impossible to obtain the necessary land by purchase at satisfactory prices, and condemnation proceedings have been resorted to. At the rate of progress made in these proceedings, it is evident that considerable time will elapse before ownership will be vested in the United States.

Pending acquisition of the land required in connection with this improvement and the perfection of plans for the work, no recommendation for additional funds is made at this time. After the property has been obtained, provision should be made, however, for entire completion, either by a single cash appropriation or by contract authorization covering the entire amount required to complete the project.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Portage Lake Canal entrance and harbor of refuge.					1879[1]	155
					1880[1]	1925
Portage Lake sand deposits					1883[1]	1696
Harbor lines and general improvement.[2]	House	105	Forty-ninth	Second	1887	1971
					1889[1]	2027
General improvement[2]	House	200	Fifty-first	Second	1891	2519
Do.[2]					1893[2]	2963
Do.[1]					1896[1]	2284
Do.[1]					1899[1]	2728
Harbor map					1903[2]	1516
Harbor of refuge, vicinity Keweenaw Point.[1]	House	158	Fifty-ninth	First	1906	579
Harbor of refuge at eastern entrance.[2]	do	325	Sixtieth	do	1909	676
Enlarging Stilling Basin at west end, increase harbor of refuge.[2]	do	40	Sixty-second	do	1910	769

[1] No map.

[2] Contains map.

As a result of Government improvements (together with the earlier private improvements), this waterway has a clear width of 120 feet and a clear depth of 20 feet at low-water datum (mean low water) throughout its entire length.

The maximum draft that can be carried June 30, 1912, through the waterway is 19½ feet at mean low water.

The usual variation of water level extends from about 0 to +1 foot, referred to low-water datum. This datum is a mean low stage of water, and has been referred to permanent bench marks.

During the navigation season of 1911 the commerce through the waterway amounted to 919,203 short tons of freight, valued at $48,753,261. There were also 17,893 passengers carried.

This commerce is the through commerce of the waterway only. The local commerce, or commerce between ports within the waterway and points outside, amounted to 1,227,414 short tons, valued at $30,108,350. Previous to 1907 the through and local commerce was combined, therefore no comparison is made of the commerce of 1911 with previous years.

There was also a small local business between the ports on the waterway (Houghton, Hancock, Dollar Bay, Lake Linden, Hubbel, and Chassell) not included in the foregoing, the amount of which is not known.

The total expenditures by the Government for this waterway to date are one-sixth of 1 per cent of the value of the local vessel freight received and shipped during the period covered by these expenditures.

The annual expense of Government operations at this waterway, consisting of maintenance, interest, and depreciation, is approximately $97,876. This amounts to 8 cents per ton of the local vessel freight for the year 1911 and one-third of 1 per cent of the value of this freight, and is about 4 per cent of the saving in the cost of transportation on this freight by water, as compared with rail rates. Details of these comparisons may be seen in Table 4, Appendix I I 7. The through commerce of this waterway has also been benefited by these expenditures.

Effect of project on freight rates: Based on the above commerce (of the local ports on this waterway), the estimated saving of $1.92 per ton in freight rates by water over railroad rates for the year 1911 amounts to $2,356,635. This business would not be possible except for the improvements to this waterway, which the Government has either executed itself or paid for by purchase.

This waterway also serves a useful purpose as a harbor of refuge, and is much used by vessels bound up or down doing business at the head of the lake, particularly during the stormy season in the fall of the year. As many as 46 vessels have been tied up at one time at Lily Pond waiting for weather. By lessening the danger and risk of navigation in this manner, to whatever degree, makes this waterway to that extent a factor in the reduction of cost of transportation.

Another improvement that would be of value to navigation is the straightening of the channel of Portage River by cutting off Princess Point, with its sharp bend, that is causing inconvenience, groundings, and delays to the larger vessels.

July 1, 1911, balance unexpended	$36,806.29
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	223.50
July 1, 1912, balance unexpended	36,582.79
Amount (estimated) required to be appropriated for completion of existing project	[1] 175,000.00

(See Appendix I I 7.)

8. Operating and care of waterway across Keweenaw Point, from Keweenaw Bay to Lake Superior, Mich.—During the fiscal year ending June 30, 1912, the sum of $57,381.84 from the permanent indefininte appropriation of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909, was expended in repairs to the breakwaters, the revetments, in dredging shoals, in superintendence and general operation of the canals, guarding against encroachments on the channels by private parties and corporations, on surveys and mapping of the waterway, and the collection of commercial statistics. Additional details are given in the district officer's report, Appendix I I 7.

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[1] Exclusive of the balance unexpended July 1, 1912.

An allotment of $19,000 (including $10,072.13 left over from last allotment), from the same source and for the same purpose, has been made for the fiscal year ending June 30, 1913.

To June 30, 1912, $299,685.51 had been expended on this work.

For further details, see report on this work by the district officer.

(See Appendix I I 7.)

9. Harbor at Marquette, Mich.—This harbor is a bay about 2 miles across the opening and 1 mile deep, situated on the south shore of Lake Superior, 158 miles west of Sault Ste. Marie and 258 miles east of Duluth.

The harbor, which had a natural depth of 18 feet or more at mean low water, afforded no protection to vessels from easterly or northeasterly storms, and projects were approved in 1867 (see Report of Chief of Engineers, 1866, III, 8; IV, 81) and 1889, project submitted March 12, 1889, approved by Chief of Engineers April 18, 1889, for the construction of a breakwater composed of cribs filled with rock and projecting from the shore into the bay a distance of 3,000 feet. This breakwater was finished in 1894 practically as projected, but since its commencement extensive repairs have been made to the superstructure.

The amount expended up to the commencement of operations upon the new project was $469,732.44.

A project for a concrete superstructure was approved by the Chief of Engineers February 27, 1890. Its estimated cost was $232,936.71.

Work on this concrete superstructure was begun in the spring of 1895, and it is now built to a length of 2,920 feet, which is 97 per cent of the entire length. It is 100 feet short of the end of the old breakwater.

Provision now having been made by Congress for an extension of the breakwater, as noted below, no pierhead will be required at the present end of the breakwater, but when the time arrives for the construction of the concrete superstructure for the extension this gap in the old work will be filled out with the regular form for the old structure, at an estimated cost of $6,000.

The amount expended upon the project for a concrete superstructure and breakwater extension up to the close of the fiscal year ending June 30, 1912, not including outstanding liabilities, was $242,425.20, of which $25,855.79 was spent for maintenance.

Congress in the river and harbor act of June 25, 1910, authorized the construction of an extension to the present breakwater, to a distance of 1,500 feet in a southeasterly direction, to consist of timber cribs resting upon a rubble mound embankment, and with a concrete superstructure, in accordance with a plan designated as type 2, and also authorized dredging for the removal of a shoal in the northerly portion of the harbor, at a total estimated cost of $489,000. A detailed description of this project is given in House Document No. 573, Sixty-first Congress, second session.

The river and harbor act of February 27, 1911, made an appropriation of $88,000, and authorized continuing contracts in the further sum of $311,000 for completion of the project.

The existing project with modifications provides for the construction of a breakwater composed of cribs filled with rock and projecting in a southerly direction from the shore into the bay a distance of 3,000 feet (estimated cost, $506,129.58), and for a concrete superstructure to same ($232,936.71); also for an extension to the breakwater for a distance of 1,500 feet in a southeasterly direction to consist of timber cribs resting upon a rubble mound embankment, with a concrete superstructure, in accordance with a plan designated as type 2, described in House Document No. 573, Sixty-first Congress, second session; also for the removal of a shoal in the northerly portion of the harbor ($489,000). Total estimated cost, $1,228,066.29.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Lake survey					1866 [1]	8, 81
Do					1867	58, 566
Harbor lines					1889 [1]	2027
Harbor map					1908 [2]	1822
General improvement additional harbor of refuge.[2]	House	161	Fifty-eighth	Second	1904	2786
Extension of breakwater and dredging inner end of harbor.[2]	do	573	Sixty-first	do	1910 [2]	757
					1911 [2]	2291

[1] No map.

[2] Contains map.

Dredging for the removal of the shoal in the northern part of the harbor was completed in accordance with the project in the year ending June 30, 1911, as further described in Annual Report for 1911, page 808.

Operations for the fiscal year consisted in the commencement of the 1,500-foot extension to the breakwater by building a portion of the rock embankment which is to serve as a foundation for the cribs. Only a small amount of work was accomplished, namely, 5,817 tons of rock delivered in place at a contract price of 84 cents, or $4,886.28. Contract annulled January 26, 1912, and a new contract entered into April 20, 1912, for continuing the work at price of $1.11 per ton, under which work is to commence by August 1, 1912. Further details in Appendix.

The operations so far executed at this harbor have afforded material protection to the ore, coal, lumber, and commercial wharves from storms, removed obstructing shoals, and thus facilitated the transaction of a large commerce.

The proportion of the approved project accomplished to date is 60 per cent.

The usual variation of water level extends from 0 to +1 foot above low-water datum, this plane of reference being a mean low-water level. It is referred to permanent bench marks.

The vessel commerce of this port was 780 arrivals and clearances during the fiscal year ended June 30, 1872, with a registered tonnage of 370,000 short tons, and 557 arrivals and clearances in 1911, carrying 1,838,873 short tons, valued at $8,649,960.

The total commerce from 1867 to 1911, inclusive, is estimated at 31,017,696 short tons, valued at $165,561,501.

The total expenditures by the Government for this harbor to date are less than one-half of 1 per cent of the value of the vessel freight received and shipped during the period covered by those expenditures.

The commerce of the neighboring harbor of Marquette Bay, 3 miles distant, is also benefited by the improvements at Marquette, as vessels working at Marquette Bay have to run to Marquette for protection in time of severe storms.

The combined commerce of the two ports thus benefited consisted of 901 arrivals and clearances in the calendar year 1911, with 2,488,906 registered tonnage, and 2,856,047 short tons of freight received and shipped, valued at $12,211,280.

The total commerce of these two ports from the commencement of Government improvements in 1867 to 1911, inclusive, is estimated at 54,198,243 short tons, valued at $230,426,936.

The annual expense of Government operations at this harbor, consisting of maintenance, interest, and depreciation, is approximately $39,943. This amounts to $0.022 per ton of vessel freight of Marquette for the year 1911, to less than one-half of 1 per cent of the value of this freight, and is about 1 per cent of the saving in the cost of transportation on this freight by water as compared with rail rates. Details of these comparisons may be seen in Table 4 of Appendix I I 8 of this report.

Effect of project on freight rates: Taking the estimated saving in cost of transportation by water over that by rail as $1.92 per ton, as per table 4 of this report, and the amount of vessel freight in 1911, as 1,838,873 tons (exclusive of the business done at Marquette Bay), makes a total saving of $3,530,636 for the one year. This may be said to have been effected by Government improvements, as lake commerce could not otherwise be transacted at that locality.

It is expected that the embankment for the breakwater extension will be completed under the existing contract by September 30, 1913.

No appropriation is required for the fiscal year ending June 30, 1914, as it has been found that no more than a commencement can be made upon the cribwork in the year ending June 30, 1913.

It is estimated that the available funds will, in addition to building the rock embankment, construct the cribwork and the protection of its base for a distance of 400 or 500 feet, or nearly one-third of the entire length of the breakwater extension, on or about the end of fiscal year June 30, 1914.

In accordance with the provisions of the appropriation and authorization it is proposed to enter into contract for the construction of the entire amount of cribwork, of which the above-named crib, constructed with the cash appropriation, will form a part, and the remainder of the construction to be executed and paid for as further appropriations may be made by law. It is also proposed, at the proper time and in accordance with the terms of the appropriation, to enter into a contract or contracts for such materials and work as may be necessary for the construction of the entire superstructure.

The purpose of the proposed expenditures is for the extension of benefits.

July 1, 1911, balance unexpended		$183,374.08
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$1,000.00	
For maintenance of improvement	8,943.03	
		9,943.03
July 1, 1912, balance unexpended		173,431.05
July 1, 1912, outstanding liabilities		1,322.50
July 1, 1912, balance available		172,108.55
July 1, 1912, amount covered by uncompleted contracts		70,000.00
Amount of continuing contract authorization, act of Feb. 27, 1911		311,000.00
Amount yet to be appropriated		311,000.00
Amount (estimated) required to be appropriated for completion of existing project		[1] 311,000.00

(See Appendix I I 8.)

10. Harbor of refuge, Marquette Bay, Mich.—Marquette Bay, also known as Presque Isle Harbor, is a small bay within the city limits of Marquette, north of Marquette Harbor, and distant 3 miles therefrom.

The bay is about 1½ miles long and extends into the shore about one-half mile. The natural depth over the greater part of this area was from 18 to 20 feet at low water, and dredging by the United States has not been considered necessary.

Before improvement the locality was fully exposed to storms from the east and northeast, and comparatively little shipping was done.

A resolution of Congress, approved March 20, 1896, directed the Secretary of War to make a survey and submit an estimate for a breakwater in this bay. The results of this survey, with estimates amounting to $20,000 for a breakwater 500 feet long and $50,000 for construction of one 1,000 feet long, are published in House Document No. 318, Fifty-fourth Congress, first session.

The project adopted by the act of June 3, 1896, is to build a breakwater 1,000 feet in length off Presque Isle Point.

This breakwater was built to its full length in the years 1897–1900.

The act of Congress approved June 13, 1902, provided that a portion of the appropriation for Marquette Harbor "not exceeding seven thousand five hundred dollars may be expended in connecting the Presque Isle breakwater with the shore."

Under this provision the gap between the breakwater and shore was closed, in the fall of 1902, by a timber pier 216 feet long, and 100 linear feet of shore revetment constructed.

The existing project with modifications is to build a breakwater 1,000 feet in length off Presque Isle Point and for connecting this breakwater with the shore. Estimated cost, $57,500.

The project has been completed.

No additional work is proposed except for maintenance.

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[1] Exclusive of the balance unexpended July 1, 1912.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Breakwater for general improvement.[1]	House	818	Fifty-fourth	First	1896	307
Harbor map [2]					1903	1522

[1] No map.

[2] Contains map.

The total amount expended on the project up to the close of the fiscal year ending June 30, 1912, not including outstanding liabilities, was $57,858.74, of which $2,802.40 was expended for maintenance.

The work done has enabled vessels to lie at the ore pier and other docks in the vicinity in ordinary weather and moderate storms, and shipping has increased greatly.

This harbor is largely used for commercial purposes, but not as a harbor of refuge.

Vessels drawing 19 feet can reach the ore pier at mean low water.

The usual variation of water level extends from 0 to +1 foot above low-water datum, this plane of reference being a mean low-water level. It is referred to permanent bench marks.

The lake commerce of this port in 1897 amounted to 1,100 arrivals and departures, with 1,095,243 short tons of freight. In 1911 the lake commerce amounted to 344 arrivals and departures, with 1,017,174 short tons of freight, valued at $3,561,320.

The total commerce from 1897 to 1911, inclusive, is estimated at 23,180,547 short tons, valued at $64,865,434.

The total expenditures by the Government for this harbor to date are one-eleventh of 1 per cent of the value of the vessel freight received and shipped during the period covered by these expenditures.

The annual expense of Government operations at this harbor, consisting of maintenance, interest, and depreciation, is approximately $3,479. This amounts to 3 mills per ton of vessel freight for the year 1911 to less than one-tenth of 1 per cent of the value of this freight, and is one-sixth of 1 per cent of the saving in the cost of transportation on this freight by water as compared with rail rates. (See table 4, Appendix I I 9, of this report.)

Effect of project on freight rates: The saving in cost of transportation by water of 1911 freight over the cost by rail, at the estimated figure of $1.92 per ton, as in table 4 of this report, amounts to $1,952,974.

This was made practicable by the Government breakwater at this locality. This harbor, as already stated, is not used for purposes of refuge, and it may be questioned whether its freight business could not have been transacted at Marquette, only 3 miles distant, where the Government had already constructed a harbor.

It is proposed to expend the available balance, and the appropriation recommended, on repairs to the breakwater and for general maintenance.

July 1, 1911, balance unexpended	$4,741.84
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	100.58
July 1, 1912, balance unexpended	4,641.26
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

(See Appendix I I 9.)

11. Harbor of Refuge at Grand Marais, Mich.—This harbor is situated on the south shore of Lake Superior, 313 miles east of Duluth and 90 miles west of Sault Ste. Marie. It is a deep-water bay, well protected from storms, having a length of 1½ miles, width of three-eighths mile, an area of 240 acres, and a depth of 18 to 57 feet.

Originally the entrance to this harbor was obstructed by a bar having but 9 feet depth of water upon it at low water. The project for its improvement, submitted by a board of engineers, dated July 18, 1881, adopted by Secretary of War August 5, 1881 (see Report of the Chief of Engineers for 1881, p. 2038), and modified December 21, 1894, has for its object a deep and safe channel into the harbor, making it a harbor of refuge. This object is to be attained by building parallel piers 500 feet apart, projecting into the lake to a depth of 22 feet, and dredging out an 18-foot channel between them, connecting the deep water of the lake with that of the harbor, and by closing up the natural entrance, 5,770 feet in width, by a solid pile dike, driven with a slope toward the waves and strongly braced. The proposed length of each pier was 1,800 feet. The estimated cost of the entire project was $484,000. The west pier has now reached a length of 1,912 feet, the east pier 1,545 feet, and the pile dike is completed.

This dike was built in 1895–1897 to close the natural entrance, to protect the harbor from storms, and to prevent the movement of sand into the harbor. The expected formation of a sand beach along the line of the dike is partially realized, but much of the dike is still exposed to the heavy seas and to damage by ice.

The existing project with modifications is for building parallel piers 500 feet apart, projecting into the lake to a depth of 22 feet, and dredging out an 18-foot channel between them, connecting the deep water of the lake with that of the harbor, and by closing up the natural entrance, 5,770 feet in width, by a solid pile dike. Estimated cost of project, $484,000.

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[1] Exclusive of the balance unexpended July 1, 1912.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
General improvement					1881 [1]	2068
Lake survey					1871 [1]	87,129,131
					1888 [2]	1834
Minor surveys					1889 [2]	2024
Do					1890 [2]	2304
Do					1898 [2]	2269
Do					1894 [2]	2087
Do					1895 [2]	2577
Do					1908 [1]	1826

[1] Contains map.

[2] No map.

The amount expended on the project up to the close of the fiscal year ending June 30, 1912, not including outstanding liabilities, was $492,226.32, of which $136,341.03 was expended for maintenance.

The last dredging for the removal of shoals was done in June and will continue in progress in July, 1912; total contract cost, about $17,000. This will give a depth of 23 feet over the bar in the lake for the full width of the entrance, 500 feet, and a depth of 20 feet, with a width of 150 feet between the piers, and a greater width for a depth of 18 feet. The last previous dredging was in 1910. In August, 1911, repairs to the piers were made by riprapping the base of some of the cribs and refilling pockets with ballast, at a contract cost of $3,729. Some other repairs were made at a cost of less than $100.

The original project, with its modifications, is about 75 per cent completed, but it is possible that the work will be left in its present shape if the project for maintenance in its present condition proves satisfactory. The commerce is declining, with the exhaustion of the pine timber, but the harbor is very useful for refuge purposes, it being the only harbor in a 90-mile stretch along a coast much subject to shipwrecks.

The annual expenses of Government operations at this harbor, consisting of maintenance, interest, and depreciation, is, approximately, $25,484.66. This amounts to $1.80 per ton of vessel freight for the year 1911 and to about 4⅗ per cent of the value of this freight. (Details of these comparisons may be seen in Table IV, Appendix I I 10, of this report.)

Effect of project on freight rates: Since October, 1910, there have been no rail connections at this harbor on account of the discontinuance of the operation of the Manistique Railway, a logging road. The only means of transportation at present is by water, and for this reason no comparison can be made with railroad charges.

The usual variation of water level extends from 0 to 1 foot above low-water datum, this plane of reference being a mean low-water level. It is referred to permanent bench marks.

In front of the entrance to the harbor the 22-foot curve of depth had in 1909 advanced lakeward between 500 and 600 feet since the project for improvement was adopted, and this fact will entail some additional expense for pier extension to deep water. This would require an addition of 450 feet to the west pier and 794 feet to the east pier, and would bring the total cost of these extensions up to $149,280—about $103,879 more than the original estimate.

Further consideration of existing conditions leads to the conclusion that possibly the project depth of 18 feet may be as efficiently and more economically maintained by dredging alone than by further extension of the piers.

The commerce of this port has increased from 1,910 short tons in 1887 to 1,769 arrivals and clearances, with 54,525 short tons of freight, valued at $2,539,780, in 1907. This was the maximum year for value. In 1911 there were 858 arrivals and clearances, with 13,600 short tons, valued at $554,580, showing a decrease of 30 per cent in freight and an increase of 3 per cent in valuation from 1910.

The total commerce from 1880 to 1911, inclusive, is estimated at 1,505,210 short tons, valued at $26,654,226.

The total expenditures by the Government for this harbor to date are less than 2 per cent of the value of the vessel freight received and shipped during the period covered by these expenditures.

It is proposed to expend the amount estimated as a profitable expenditure for the year ending June 30, 1914, in dredging for the removal of shoals, repairs to piers, and general maintenance.

July 1, 1911, balance unexpended	$49,511.54
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	6,014.54
July 1, 1912, balance unexpended	43,497.00
July 1, 1912, amount covered by uncompleted contracts	18,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 45,401.68
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 20,000.00

(See Appendix I I 10.)

EXAMINATIONS AND SURVEYS REQUIRED BY THE RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Report dated September 26, 1911, on preliminary examination of *Cornucopia Harbor, Wis.*, required by the river and harbor act approved February 27, 1911, was duly submitted by the district officer. It was reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and was transmitted to Congress, and printed in House Document No. 415, Sixty-second Congress, second session. The improvement by the United States of this locality in the manner apparently desired is not deemed worthy of being undertaken at the present time.

The local officer was also charged with the duty of making a preliminary examination and survey of *Brulé Harbor, Wis.*, required by the river and harbor act approved February 27, 1911, and reports thereon will be duly submitted when received.

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[1] Exclusive of the balance unexpended July 1, 1912.

IMPROVEMENT OF RIVERS AND HARBORS IN THE MILWAUKEE, WIS., DISTRICT.

This district was in the charge of Maj. Charles S. Bromwell, Corps of Engineers, to March 9, 1912, and from April 3, 1912, to the close of the fiscal year, and in the temporary charge of Lieut. Col. George A. Zinn, Corps of Engineers, from March 9 to April 3, 1912. Division engineer: Col. Curtis McD. Townsend, Corps of Engineers.

General statement with reference to datum plane at all harbors on western shore of Lake Michigan.—The plane of reference or datum plane to which all depths hereinafter stated are referred is a plane 581.63 feet above mean tide at New York City, or the mean level of Lake Michigan for the years 1860–1875.

1. Manistique Harbor, Mich.—The original depth at the mouth of the Manistique River was 8 feet. By private enterprise 3,000 linear feet of slab piers had been built and a channel dredged to a depth of 11 feet before any appropriation was made by the Government. Manistique is about 65 miles northwesterly from Charlevoix, Mich., and about 97½ miles northeasterly from Sturgeon Bay Canal.

The original project, adopted in 1880, provided for increasing the depth of the channel to 13 feet below datum for a width of 150 feet by dredging. The amount expended on this project was $3,955.05.

The existing project was adopted by the river and harbor act of March 3, 1905, and provided for pier construction, breakwater extension, and dredging to a depth of 19 feet below datum; estimated cost, $270,000.

In accordance with a provision in the river and harbor act of March 2, 1907, a modification of this project was approved by the Secretary of War April 3, 1908. The modification consists mainly in swinging the inner end of the proposed west pier to the westward, thereby providing a stilling basin, and in extending the east breakwater about 90 feet farther westward than at first provided and increasing the depth of channel to 20 feet; estimated cost $338,462.

Neither of the foregoing estimates includes the acquisition of land and existing structures required in connection with the proposed work, which have been transferred to the United States without expense.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth of Manistique River					1873 [1]	254
Project of 1880	Senate	[2] 32	Forty-sixth	Second	1880 [1]	1981
Project of 1905	House	[2] 429	Fifty-ninth	do	1904 [1]	2369
Modification of 1907					1908 [2]	1942
Work under contract					1911 [2]	2304

[1] No maps.

[2] Contains maps.

The existing project as modified provides for the construction of a west pier 1,480 feet long, of which 1,000 feet consists of timber cribs on stone foundation and the remainder of pile pier connecting the cribs with the shore; of an east pier extending from the easterly end of old breakwater to shore, about 930 feet long, of which 300 feet consists of timber cribs on stone foundation and the remainder of pile pier; of an extension to the breakwater at its westerly end of 400 feet, consisting of timber cribs on stone foundation, all piers and breakwater extension to be provided with concrete superstructure; concrete superstructure on about 420 feet of old breakwater; about 400 feet of plank crib revetment on the westerly side of the mouth of the Manistique River; and a channel 20 feet deep.

The expenditures during the fiscal year have been for construction of a portion of the west pier, for breakwater extension, for repairs of plant, and for general supervision in furtherance of the existing project.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $115,218.40, none of which was applied to maintenance.

About 30 per cent of the approved project has been accomplished. No practical result in the way of increased depth or width has been obtained under the present project as yet. The maximum draft that could be carried June 30, 1912, was about 16 feet. The usual mean annual variation of level of water surface is about 1 foot. A dam across the Manistique River, located about 1 mile from the mouth of the harbor, constitutes the head of navigation.

Commercial statistics for 1911.—Total number of vessels, 380; shipments and receipts, 278,594 short tons; approximate valuation, $5,402,835.

The commerce affected by the project is forest products, iron and steel, coal, and general merchandise. Car ferries call at this harbor during the entire year. No change in the nature of the commerce has as yet resulted.

It is believed that the project will have a material effect in controlling freight rates on bulk commodities, such as coal, forest products, etc., both locally and for transshipment.

It is proposed to expend the available balance in completing the project, the funds now available being sufficient for that purpose.

July 1, 1911, balance unexpended	$265, 329. 38
June 30, 1912, amount expended during fiscal year, for works of improvement	40, 040. 83
July 1, 1912, balance unexpended	225, 288. 55
July 1, 1912, outstanding liabilities	5, 252. 07
July 1, 1912, balance available	220, 036. 48
July 1, 1912, amount covered by uncompleted contracts	54, 000. 14

(See Appendix J J 1.)

2. *Gladstone Harbor, Mich.*—The harbor of Gladstone is a natural one, and the main channel is from 24 to 42 feet in depth. The portion of this harbor under improvement was obstructed by shoals.

Gladstone is about 74 miles west of Manistique, Mich., and about 62.5 miles northerly from Menominee, Mich.

The original project, which is the existing project, was adopted by act of March 3, 1905, and provides for dredging to a depth of 21 feet below datum of so much of the harbor as lies outside of a line drawn perpendicular to the axis of the ore dock through its outer end. Estimated cost, $14,000. (H. Doc. No. 165, 58th Cong. 2d sess., with map; also Annual Report, 1904, p. 2861.) There has been no modification of the existing project since its adoption.

There have been no operations or expenditures during the fiscal year.

The amount expended on the work up to the close of the fiscal year ending June 30, 1912, was $7,532.76, of which $252.17 was applied to maintenance.

The approved project was completed in 1905; since then the expenditures have been for maintenance. The maximum draft which could be carried June 30, 1912, was about 20 feet. The usual mean annual variation of level of water surface is about 1 foot.

Commercial statistics for 1911.—Total number of vessels, 167; shipments and receipts, 449,223 short tons; approximate valuation, $12,874,800.

The commerce affected by the project is mostly coal, grain, flour, and general merchandise, and is general in character. A large volume of commerce is affected by the project.

It is believed that the project has a material effect in controlling freight rates on bulk commodities, such as coal, grain, and ore, both locally and for transshipment.

The existing project is for dredging to provide a 21-foot channel to the ore dock. As the ore dock has been abandoned no estimates for further appropriations will be submitted either for additional work or maintenance.

July 1, 1911, balance unexpended	$6,467.24
July 1, 1912, balance unexpended (to be carried to the surplus fund of the Treasury)	6,467.24

(See Appendix J J 2.)

3. *Menominee Harbor and River, Mich. and Wis.*—Prior to improvement by the Government, all commerce was transacted over bridge piers extending into Green Bay. Menominee is about 48 miles northeasterly from the city of Green Bay, and about 24 miles westerly from Sturgeon Bay Canal.

The harbor and river, which originally constituted two works, were consolidated by the act of June 13, 1902. The original depth of channel was about 5 feet, and no harbor existed at this place.

(*a*) *Harbor.*—The original project, adopted in 1871, provided for two parallel piers, 400 feet apart, extending to the 16-foot contour in Green Bay, and for a channel 15 feet deep between them, modified as follows: 1874, extending piers to 17-foot contour; 1890, increasing depth to 17 feet; 1899, increasing depth to 20 feet. Amount expended on original and modified projects, $234,344.77.

(*b*) *River.*—Original navigable depth, 5 feet. The original project, adopted in 1890, provided for a channel 200 feet wide and 17 feet deep, modified as follows: 1892, width at upper end reduced to 100 feet; 1896, formation of a turning basin 250 feet wide, 600 feet long, 17 feet deep at upper end of channel, and extending channel 425 feet for a width of 75 feet. Amount expended on original and modified projects, $114,414.15.

(c) *Harbor and river.*—The existing project, adopted by act of Congress approved June 13, 1902, provides for increasing the depth to 20 feet, at an estimated cost of $60,000. Under a provision of the act of March 3, 1905, the existing project was modified by omitting therefrom the improvement of all that portion of the Menominee River above and to the westward of Ogden Street Bridge.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Part.	Page.
Project of 1874, harbor entrance					1876 [1]	II	384
Do					1878 [1]		1142
Do					1881 [1]		2060
Project of 1890, harbor and river	House	[1] 34	Fifty-first	First	1890 [2]		2304
Project of 1899, harbor entrance	do	[1] 86	Fifty-fourth	Second	1897 [2]		2751
Project of 1902, harbor and river	do	[1] 419	Fifty-sixth	First	1900 [2]		3739
Outer breakwater, preliminary examination.	do	[2] 78	Sixtieth	First			

[1] Contains maps. [2] No maps.

The expenditures during the fiscal year have been for dredging, for repairs of piers, repairs and purchase of plant, and for general supervision.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $67,242.19, of which amount $28,990.50 was applied to maintenance. Of this amount $3,514.17 was derived from miscellaneous sources.

The existing project, as modified, was completed in 1903. Since then the expenditures have been for maintenance. The maximum draft that could be carried June 30, 1912, over the shoalest part of the locality under improvement was about 18½ feet. The mean annual variation of level of water surface is about 1 foot. The Menominee River is navigable for a distance of about 2 miles from its mouth.

Commercial statistics for 1911.—Menominee, Mich., and Marinette, Wis.: Total number of vessels, 1,069; shipments and receipts, 305,503 short tons; approximate valuation, $5,253,940.

It is believed that the project has a material effect in controlling freight rates on bulk commodities, such as coal, grain, and lumber, both locally and for transshipment.

It is proposed to expend the amount recommended for expenditure in fiscal year ending June 30, 1914, in repairs of piers and dredging for restoration of channel.

July 1, 1911, balance unexpended	$10,092.46
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	4,159.40

July 1, 1912, balance unexpended	$5,933.06
July 1, 1912, outstanding liabilities	4,548.39
July 1, 1912, balance available	1,384.67
Amount appropriated by river and harbor act approved July 25, 1912	9,000.00
Amount available for fiscal year ending June 30, 1913	10,384.67
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 24,000.00

(See Appendix J J 3.)

4. *Oconto Harbor, Wis.*—The original depth at the mouth of the river, about 3 feet, was increased by private enterprise to 4 feet before work was begun by the United States. Prior to improvement by the Government all commerce was transacted over a bridge pier. Oconto is about 25 miles northwesterly from Menominee and about 31 miles northeasterly from the city of Green Bay.

The original project, adopted in 1882, provided for extending the parallel slab piers built by the city of Oconto to the 11-foot contour in Green Bay, and for a channel 100 feet wide and 9 feet deep extending up the Oconto River a distance of about 2 miles, at an estimated cost of $150,000; modified in 1897 by abandoning the upper 3,800 feet of the channel; estimated cost of modified project, $115,610. The amount expended on this project is $92,730.65.

The existing project, adopted by the river and harbor act of June 25, 1910, provides for a channel 17 feet deep and 100 feet wide between the present piers, and for an extension beyond the present piers of the same depth, with a minimum width of about 150 feet to about the 18-foot contour. The dredging to be continued at the same depth inside the shore line for a distance up the river of about 800 feet, forming a turning basin in accordance with plan printed in House Document No. 538, Sixty-first Congress, second session. Estimated cost, $75,000. The act, in adopting the project, provided that it shall be subject to certain conditions relative to cooperation on the part of local interests. Stated briefly, these conditions are: That the city of Oconto shall donate or cause to be donated to the United States all necessary land; that the city and county of Oconto shall raise the sum of $25,000 for construction of revetments, etc.; that the city of Oconto shall give assurances satisfactory to the Secretary of War that it will build a suitable wharf, warehouse, and rail or highway connection between the city and the harbor; that it will forever maintain the ownership of said wharf, warehouse, etc., and that the same may always be open to the public under reasonable regulations as regards wharfage and warehouse fees; and that it will maintain a depth in all channels dredged by the United States for a period of five years. There has been no modification of this project since its adoption.

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[1] Exclusive of amount available for fiscal year 1913.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth of Oconto River					1871[1]	120
Mouth of Oconto River to city of Oconto.					1880[1]	1978
Do					1881[1]	2062
Project of 1882					1883[1]	1644
Do					1884[2]	1840
Do					1888[2]	1840
Increasing depth to 16 feet, preliminary examination.					1889[1]	2106
Do	House	[1] 54	Fifty-third	Third	1895[1]	2681
Increasing depth to 16 feet, survey	do	[2] 223	Fifty-fourth	First	1896[1]	2560
Increasing depth, preliminary examination.	do	[1] 50	Fifty-sixth	do	1900[1]	3745
Report of Board of Engineers for Rivers and Harbors.					1908[1]	1886
Increasing depth to 16 and 18 feet, preliminary examination.	House	[1] 161	Fifty-ninth	First		
Existing project	do	[2] 588	Sixty-first	Second		

[1] No maps.

[2] Contains maps.

The expenditures during the fiscal year have been for dredging for improvement and for general supervision.

The total amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $46,184.25, none of which was applied to maintenance.

The existing project was completed in May, 1912. The depth of river channel between the turning basin and the city of Oconto is being increased by the city, but no continuous channel is yet available. There has been no commerce during the calendar year 1911 by way of the harbor, as the project has just been completed.

The maximum draft that could be carried June 30, 1912, was about 14½ feet. The mean annual variation in level of water surface is about 1 foot. The Oconto River has a navigable depth of about 3 feet for a distance of about 2 miles from its mouth.

It is believed that the project will have a material effect in controlling freight rates on bulk commodities, such as lumber, coal, and grain, both locally and for transshipment.

July 1, 1911, balance unexpended	$74,268.10
June 30, 1912, amount expended during fiscal year, for works of improvement	45,452.35
July 1, 1912, balance unexpended	28,815.75

(See Appendix J J 4.)

5. *Green Bay Harbor, Wis.*—This work consists of two improved channels—first, from the mouth of Fox River northerly to the 21-foot contour in Green Bay, a distance of about 4 miles; second, Fox River below Depere to the southerly limits of the city of Green Bay, a distance of about 4 miles. The intervening pool in Fox River, connecting these channels, has a natural depth of from 25 to 40 feet and requires no improvement. The outer channel was originally circuitous and narrow, with an available depth of 11 feet. The original

navigable depth of the inner channel was also 11 feet. The city of Green Bay is located at the head of Green Bay and is about 48 miles southwesterly from Menominee, Mich.

The original project for outer channel, adopted in 1866, provided for dredging a channel 200 feet wide, 13 feet deep, and 8,800 feet long, and for revetting about 650 feet of same at Grassy Island, modified as follows: 1872, straightening channel and increasing depth to 14 feet; 1874, depth 15 feet, length 11,600 feet; 1892, depth 17 feet, length 16,500 feet; 1897, increasing width at entrance to 500 feet. The original project for inner channel, adopted in 1892, provided for dredging a channel 150 feet wide and 13 feet deep, modified as follows: 1896, increasing depth to 17 feet. The total amount expended on original and modified projects is $405,945.18.

The existing project, adopted by act approved June 13, 1902, provides for increasing the depth of the outer channel to 20 feet, at an estimated cost of $105,600. It also provides for maintenance of existing works. There has been no modification of the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Project of 1866					1867 [1]	69
Project of 1874					1876 [2]	II, 388
Do					1878 [2]	1144
From lighthouse to first bridge across Fox River.	House	[1] 22	Fifty-second	Second	1893 [2]	2778
Project of 1892					1894 [2]	2054
Project of 1902	House	[2] 232	Fifty-sixth	First	1900 [1]	3747

[1] No maps.

[2] Contains maps.

The expenditures during the fiscal year have been for dredging for restoration of outer channel, for taking soundings, and for general supervision.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $163,358.22, of which amount $61,018.50 was applied to maintenance.

The approved project was completed in 1903. Since then all expenditures have been for maintenance. The maximum draft that could be carried June 30, 1912, was about 18½ feet in the outer channel and 15 feet in the inner channel. The mean annual variation in level of water surface is about 1 foot. Connecting with the upper end of the inner channel at Depere, Wis., Fox River is navigable by canals and slack-water navigation to Portage, Wis., a distance of 156 miles.

Commercial Statistics for 1911.—Total number of vessels, 518; shipments and receipts, 751,326 short tons; approximate valuation, $7,669,500.

The commerce of Green Bay is large and of a general character.

It is believed that the project has a material effect in controlling freight rates on bulk commodities, such as coal, grain, and lumber, both locally and for transshipment.

It is proposed to expend the amount recommended for expenditure in fiscal year ending June 30, 1914, for dredging for maintenance of the outer and inner channels.

July 1, 1911, balance unexpended	$12,178.15
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	11,350.66
July 1, 1912, balance unexpended	827.49
Amount appropriated by river and harbor act approved July 25, 1912	32,000.00
Amount available for fiscal year ending June 30, 1913	32,827.49
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 14,000.00

(See Appendix J J 5.)

6. Depere Harbor, Wis.—The harbor of Depere is at the head of deep water navigation on the Fox River. In its original condition, it was impossible for vessels over 250 feet in length to turn, the natural channel having a minimum depth of about 14 feet for a width of about 250 feet. Depere is about 5 miles south of the city of Green Bay.

The original project, which is the existing project, adopted by the river and harbor act of June 25, 1910, provides for a turning basin having a depth of 17 feet and of sufficient area to permit of vessels not exceeding 350 feet in length to turn readily at all times without the assistance of a tug, in accordance with report and plan printed in House Document No. 522, Sixty-first Congress, second session. Estimated cost, $11,500. There has been no modification of the existing project since its adoption.

There were no operations during the fiscal year. The expenditures have been for repairs of plant and general supervision.

The amount expended on the work of the existing project up to the close of the fiscal year ending June 30, 1912, was $9,254.79, of which $1,836.57 was applied to maintenance.

The approved project was completed in 1910. The maximum draft that could be carried June 30, 1912, was about 15 feet. The mean annual variation in level of water surface is about 1 foot.

Commercial statistics for 1911.—Total number of vessels, 118; shipments and receipts, 29,419 short tons; approximate valuation, $172,785.

It is believed that the project will have a material effect in controlling freight rates.

July 1, 1911, balance unexpended	$4,081.78
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,836.57
July 1, 1912, balance unexpended	2,245.21

(See Appendix J J 6.)

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[1] Exclusive of amount available for fiscal year 1913.

7. Sturgeon Bay and Lake Michigan Ship Canal, Wis., and harbor of refuge connected therewith.—In its natural condition Lake Michigan was separated from Sturgeon Bay, an arm of Green Bay, by a neck of land about 1⅜ miles wide, having a maximum elevation above the lake level of about 28 feet. The Sturgeon Bay & Lake Michigan Ship Canal & Harbor Co., from 1872 to 1881, constructed across this neck a canal without locks or gates 7,200 feet long, 100 feet wide at water surface, and 14 feet deep, and in continuation of the canal dredged a channel in Sturgeon Bay 6,100 feet long of about same dimensions as the canal. Of the 14,000 linear feet of canal banks, 8,437 feet was provided with pile revetments. The United States assumed possession of the canal April 25, 1893. Before the construction of the harbor of refuge was undertaken the Lake Michigan entrance to the Sturgeon Bay and Lake Michigan Ship Canal was entirely unprotected from storms from northeast to southwest. Sturgeon Bay Canal is about 55 miles north of Manitowoc, Wis., and about 25 miles east of Menominee, Mich.

The original project for the canal adopted in 1894 provided for building 6,000 linear feet of revetment, width between new revetments to be 160 feet, for building 2,000 linear feet of fender piling, and for a channel 15 feet deep, modified as follows: 1896 provided for a width of 250 feet between revetments for the westerly 1,000 feet of the canal and for increasing width between revetments whenever rebuilt to 160 feet. The original project as modified was completed during the fiscal year ending June 30, 1903. The original project for the harbor of refuge, adopted in 1873, provided for the construction of converging piers 850 feet apart at the shore line and 250 feet apart at outer end, inclosing an area of about 10 acres, which was to be dredged to the requirements of navigation at that time, modified as follows: 1879, provided for sheet piling the pile piers; 1880, provided for extending each pier 150 feet by detached cribs, thereby increasing width of entrance to 335 feet and dredging to a depth of 17 feet. The original project as modified was completed in 1884. The amount expended on the foregoing projects is $354,119.26.

The canal and harbor of refuge, which originally constituted two separate works, were consolidated by the act of June 13, 1902. The existing project, adopted by act of Congress approved June 13, 1902, provides for maintenance and for increasing the depth of channel to 21 feet from Lake Michigan to Sturgeon Bay; estimated cost, $222,000. The river and harbor act approved March 2, 1907, authorized dredging in the vicinity of Hills Point. There has been no other modification of the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Head of Sturgeon Bay to Lake Michigan.					1872 [1]	171
Harbor of refuge, project of 1873					1878 [2]	1148
Head of Sturgeon Bay to Lake Michigan, including harbor of refuge.					1878 [2]	1152
Harbor of refuge, project of 1880					1880 [2]	1908
Do					1881 [2]	2076
Head of Sturgeon Bay to Lake Michigan, report of board of engineers.	Senate	[2] 84	Forty-seventh	Second	1883 [1]	1678
Do	House	[1] 106	Forty-ninth	do		
Resolution of Lake Carriers' Association of Buffalo, favoring purchase of canal by United States.	do	[1] 147	do	do		
Head of Sturgeon Bay to Lake Michigan.					1898 [2]	2729
Hills Point, in Sturgeon Bay, to Lake Michigan, project of 1902.	House	[2] 117	Fifty-sixth	Second	1901 [1]	2970

[1] No maps. [2] Contains maps.

There have been no operations during the fiscal year, nor any expenditures.

The amount expended on existing project up to the close of the fiscal year ending June 30, 1912, is $255,343.14, of which $19,125.69 was applied to maintenance. Of this amount $12,129.40 was derived from miscellaneous sources.

The approved project was completed in 1909.

The maximum draft that could be carried June 30, 1912, between Lake Michigan and Green Bay was about 19 feet. Mean annual variation in level of water surface is about 1 foot. As a result of the expenditures the largest vessels can now pass between Lake Michigan and Green Bay.

Commercial statistics for 1911.—Number of vessels passing through canal, 7,676; tonnage, 571,773 short tons. Approximate valuation, $13,074,061.

It is believed that the project has a material effect in controlling freight rates on bulk commodities, such as coal, grain, and lumber. It is impracticable to estimate the amount of reduction in rates thereby effected.

July 1, 1911, balance unexpended	$30,000.00
July 1, 1912, balance unexpended	30,000.00

(See Appendix J J 7.)

8. *Operating and care of Sturgeon Bay and Lake Michigan Ship Canal, Wis.*—Under an allotment from the indefinite appropriation of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909, for operating and care of canals and other works of navigation, there was expended during the fiscal year ending June 30, 1912, $13,522.49.

The amount expended to June 30, 1912, is $351,584.42, including $1,545.91 miscellaneous receipts.

The operations during the fiscal year consisted in dredging for maintenance of channel, making necessary repairs to revetments, and to the buildings and plant pertaining to the canal, and in operating and caring for the canal in accordance with the approved project.

Navigation through the canal opened March 20, 1911, closed by ice December 27, 1911, and resumed April 8, 1912.

For commercial statistics, see report upon improvement of Sturgeon Bay and Lake Michigan Ship Canal and harbor of refuge connected therewith.

(See Appendix J J 8.)

9. Algoma Harbor, Wis.—Previous to the improvement of this harbor the depth of water at the mouth of the Ahnapee (or Wolf) River was only 3 feet, and there was no harbor at this place. Algoma is about 16 miles south of Sturgeon Bay Canal, and about 40 miles north of Manitowoc, Wis.

The original project, adopted in 1870, provided for the formation of an outer harbor at the mouth of the Ahnapee River by pier construction and dredging, modified as follows: 1873, provided for a small harbor near mouth of river which might be utilized should the larger outer harbor ever be required; 1875, provided for extension of piers to 18-foot contour in Lake Michigan and the formation of a small inner harbor 100 feet wide and 13 feet deep extending from the highway bridge to the mouth of the river, a distance of about 1,000 feet; 1884, width of entrance increased to 200 feet by offset in each pier, main and detached piers to be connected by guide piling; March 3, 1899, provided for extending the 13-foot channel, for a width of 50 feet, a distance of 800 feet by rock removal and dredging, at an estimated cost of $19,266. The amount expended on this project and its modifications to June 30, 1908, is $201,681.46, of which $8,687.96 was for maintenance.

The existing project, adopted by act approved March 2, 1907, provides for the construction of an outer harbor with a depth of 16 feet; estimated cost, $140,000, all of which has been appropriated. There has been no modification of this project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Part.	Page.
Outer harbor, project of 1870					1871 [1]		125
Project of 1875					1876 [2]	II	359
Do					1879 [2]		1519
Project of 1884					1888 [2]		1846
Extension of channel, rock removal, project of 1899.	House	[2] 172	Fifty-fourth	Second	1897 [1]		2756
Project of 1899					1908 [2]		1848
Outer harbor, existing project.	House committee.	[1] 20	Sixty-first	Second			
Do					1908 [2]		1854

[1] No maps. [2] Contains maps.

The expenditures during the fiscal year have been for repairs of revetment for the general shipyard of the district at Kewaunee, Wis., for repairs and purchase of plant, and for general supervision.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $122,031.10, of which $21,191.65 was applied to maintenance.

The existing project has been completed. The maximum draft that could be carried June 30, 1912, was about 15 feet. The mean annual variation of water surface is about 1 foot.

Ahnapee River is navigable for a distance of about 2 miles from its mouth for crafts drawing 4 feet, but there are no vessels plying on it.

Commercial statistics for 1911.—Total number of vessels, 185; shipments and receipts, 9,298 short tons; approximate valuation, $269,780.

The commerce benefited is entirely local. It is believed that the project has a considerable effect in controlling freight rates on coal and similar bulky articles. It also probably exercises a controlling effect on freight rates on general merchandise for local consumption.

July 1, 1911, balance unexpended	$31,104.40
Miscellaneous receipts	28.53
	31,132.93
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	5,495.41
July 1, 1912, balance unexpended	25,637.52
July 1, 1912, outstanding liabilities	32.90
July 1, 1912, balance available	25,604.62

(See Appendix J J 9.)

10. Kewaunee Harbor, Wis.—The original entrance to the Kewaunee River was not more than 20 feet wide, with a depth of about 3 feet at its shoalest point, and was obstructed by submerged bowlders. Originally there was no harbor at this place, and all commerce was transacted over bridge piers. Kewaunee is about 29 miles north of Manitowoc and about 26 miles south of Sturgeon Bay Canal.

The original project adopted in 1881 provided for an artificial entrance channel 15 feet deep, located about 2,000 feet south of the river mouth, protected by two parallel piers 200 feet apart, and extending from the shore to the 19-foot contour in Lake Michigan. The amount expended on this project to June 30, 1912, was $212,997.62, of which amount $62,997.63 was for maintenance. Of this amount $592.30 was derived from miscellaneous sources.

The existing project, adopted by the river and harbor act of June 25, 1910, provides for increasing the depth in entrance channel to 20 feet and for a turning basin of the same depth, to be formed by cutting away part of the point included between the old and present river channels, in accordance with the plan printed in House Document No. 324, Sixtieth Congress, first session, at an estimated cost of $53,690, subject to the following conditions:

First. The city of Kewaunee to donate or cause to be donated to the United States all land that must be acquired for the formation of the turning basin.

Second. The city of Kewaunee to hold the United States free from liability for all damages that may be claimed by riparian owners as a result of the dredging herein proposed.

Third. The city of Kewaunee to give satisfactory assurance that it will cause to be constructed, as soon as dredging has progressed sufficiently, a suitable revetment across the point between the old and present river channels.

The river and harbor act of July 25, 1912, authorized that condition No. 3 be waived in accordance with the report of the Board of Engineers for Rivers and Harbors, dated February 26, 1912, and printed in House Rivers and Harbors Committee Document No. 7, Sixty-second Congress, second session. There has been no other modification of this project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth of Kewaunee River	Senate	[1] 175	Twenty-fifth	Second		
Do					1873 [2]	258
Project of 1881					1881 [1]	2282
Do					1888 [1]	1846
Do					1896 [1]	2724
Do					1897 [1]	2676
Harbor of refuge	House	[1] 362	Fifty-sixth	First	1900 [2]	3752
Existing project, 20-foot depth	do	[1] 824	Sixtieth	do		

[1] Contains maps.

[2] No maps.

The expenditures during the fiscal year, made under the original project, have been for dredging, for restoration of channel under the original project, for repairs of piers, repairs and purchase of plant, and for general supervision.

The original project was completed in 1898 at a cost of about $150,000. Since then all expenditures have been for maintenance.

As the city of Kewaunee has failed to comply with any of the conditions precedent, no work has been done under the present project.

The maximum draft that could be carried June 30, 1912, was about 15 feet. The mean annual variation in level of water surface is about 1 foot. Connecting with the westerly end of the improved channel Kewaunee River has a navigable depth of 4 feet for a distance of about 6½ miles, but there is no regular commerce on the river.

Commercial statistics for 1911.—Total number of vessels, 367; shipments and receipts, 143,584 short tons; approximate valuation, $8,139,550.

The project has a material effect in controlling freight rates, as the car-ferry steamers form a lake-and-rail route between eastern and western points. It is impracticable to estimate the amount of reduction in rates thereby effected.

It is proposed to expend the amount recommended for expenditure in fiscal year ending June 30, 1914, in dredging for maintenance of 15-foot channel and in repairs of piers.

July 1, 1911, balance unexpended	$61, 538. 38
Miscellaneous receipts	100. 61
	61, 638. 99
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	13, 244. 31
July 1, 1912, balance unexpended	48, 394. 68
Amount appropriated by river and harbor act approved July 25, 1912	10, 000. 00
Amount available for fiscal year ending June 30, 1913	58, 394. 68
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 6, 000. 00

(See Appendix J J 10.)

11. Two Rivers Harbor, Wis.—The original depth of the entrance to Twin Rivers was from 3 to 4 feet, and no harbor existed at this place. Two Rivers is about 5½ miles northerly from Manitowoc and about 50 miles south of Sturgeon Bay Canal.

The original project, adopted March 3, 1871, provided for the formation of a channel of navigable width and 13 feet deep, connecting Twin Rivers with Lake Michigan by building parallel piers extending to the 19-foot contour and dredging between them, at an estimated cost of $265,588.80, modified in 1897 by terminating the piers at the 14-foot contour. The total amount expended on original and modified project was $247,613.35.

The existing project, adopted March 2, 1907, is a modification of plan "A," printed in House Document No. 730, Fifty-ninth Congress, first session, and provides for increasing the depth of channel to 16 feet and for the construction of a stilling basin on the north side of harbor. The sum of $90,000 was appropriated for the purpose. There has been no modification of the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Part.	Page.
Project of 1871					1871 [2]		111
Do					1876 [3]	II	864
Do					1878 [3]		1156
Do					1879 [3]		1512
Do					1881 [3]		2090
Do					1898 [3]		2728
Increasing depth, preliminary examination.	House	[2] 45	Fifty-sixth	First	1900 [2]		8759
Project of 1897					1906 [3]		1850
Report of Wave Action Board	House	[2] 62	Fifty-ninth	First			
16-foot channel, existing project.	do	[3] 730	do	do			
Report of Board of Engineers for Rivers and Harbors.	House committee.	[2] 3	do	Second			

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[1] Exclusive of amount available for fiscal year 1913. [2] Contains maps. [3] No maps.

The expenditures during the fiscal year have been for dredging for maintenance of channel, for minor repairs to existing works, for repairs and purchase of plant, and for general supervision.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $89,945.68, of which $36,386.28 was applied to maintenance.

The existing project was completed in 1909. Since then all exexpenditures have been for maintenance. The maximum draft that could be carried June 30, 1912, was about 16 feet. The mean annual variation in level of water surface is about 1 foot. East and West Twin Rivers have a navigable depth of 7 feet for a distance of about 8 miles and 7 miles, respectively, from the harbor piers. There is no regular commerce on these rivers. For many years they have been used by rowboats and for floating saw logs.

Commercial statistics for 1911.—Total number of vessels, 31; receipts, 25,140 short tons; approximate valuation, $183,130.

The commerce of this harbor is small in volume and of a local character. It is believed that the project has a considerable effect in controlling freight rates not only on coal for local consumption brought in by way of the harbor, but also affording Two Rivers the rail rates accorded places at which water competition exists.

It is proposed to expend the amount recommended for expenditure in fiscal year ending June 30, 1914, in dredging for maintenance of channel and in repairs of piers.

July 1, 1911, balance unexpended	$13,764.38
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	7,223.41
July 1, 1912, balance unexpended	6,540.97
July 1, 1912, outstanding liabilities	662.25
July 1, 1912, balance available	5,878.72
Amount appropriated by river and harbor act approved July 25, 1912	7,500.00
Amount available for fiscal year ending June 30, 1913	13,378.72
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 4,000.00

(See Appendix J J 11.)

12. *Manitowoc Harbor, Wis.*—The original depth of water at the mouth of the Manitowoc River was about 4 feet at the shoalest point, and no harbor existed at this place. All commerce was transacted over bridge piers. Manitowoc is about 75 miles north of Milwaukee and about 55 miles south of Sturgeon Bay Canal.

The original project, adopted in 1854, provided for building parallel piers 220 feet apart and dredging between them to obtain a channel 12 feet in depth connecting Manitowoc River with Lake Michigan, modified as follows: 1881, provided for extending piers to 19½-foot contour and increasing depth to 19 feet at entrance and 15 feet at the shore line; 1890, provided for an exterior breakwater 400 feet long, 24 feet wide; 1896, provided for increasing depth of channel to 20 feet and extending south pier 500 feet; 1902, provided for extending the breakwater 400 feet. The original project as subsequently modified was completed in 1903. The total amount expended thereon, including maintenance up to the time of adoption of present projects, is $454,666.79.

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[1] Exclusive of amount available for fiscal year 1913.

The existing project, adopted by Congress March 2, 1907, provides for maintenance of 20-foot channel and for the reconstruction of the harbor by the removal of outer 500 feet of existing breakwater and nearly all of the old parallel piers and by construction of new breakwaters and piers in accordance with report submitted in House Document No. 62, Fifty-ninth Congress, first session, as modified by the Board of Engineers for Rivers and Harbors; estimated cost, $376,000. There has been no modification of the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth of Manitowoc River	Senate	[1] 175	Twenty-fifth	Second		
Do	do	42	Thirty-fifth	First		
Proposed arrow-head entrance					1873 [1]	204
Project of 1854					1876 [1]	II, 366
Project of 1881					1888 [1]	1852
Project of 1890					1898 [1]	2782
Project of 1896, 20-foot channel	House	[2] 300	Fifty-fourth	First		
Project of 1902, extension of breakwater.	do	[1] 233	Fifty-sixth	do	1900 [2]	3761
Harbor of refuge, preliminary examination.	do	[2] 95	do	Second	1901 [2]	2978
Turning basins in river					1903 [2]	1889
Project of 1902					1904 [1]	2828
Do					1906 [1]	1748
Report of wave-action board	House	[2] 62	Fifty-ninth	First		
Report of Board of Engineers for Rivers and Harbors.	House committee.	[2] 3	do	Second		
Project of 1907, existing project					1907 [1]	1896

[1] Contains maps. [2] No maps.

The expenditures during the fiscal year have been for repairs of revetment for the general shipyard of the district at Kewaunee, Wis., for repairs and purchase of plant and for general supervision.

The amount expended under the existing project up to the close of the fiscal year ending June 30, 1912, was $448,129.70, of which $213,881.22 was for maintenance.

The existing project is completed, and the balance available is sufficient for maintenance to June 30, 1914. The full project depth has been obtained throughout the harbor, and greatly increased protection has been afforded to the entrance to the river. The maximum draft that could be carried June 30, 1912, was about 20 feet. The usual mean annual variation of level of water surface is about 1 foot. Connecting with the western end of the Government improvement, Manitowoc River is navigable for a distance of about 1.8 miles.

Commercial statistics for 1911.—Total number of vessels, 1,640; shipments and receipts, 1,437,229 short tons; approximate valuation, $65,723,230.

The commerce is very large in volume and of a general character. Two lines of car-ferry steamers call at this harbor daily throughout the entire year.

The project has a material effect in controlling freight rates, as the car-ferry steamers form lake and rail routes between eastern and western points.

July 1, 1911, balance unexpended	$48,065.08
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	4,048.85
July 1, 1912, balance unexpended	44,016.23

(See Appendix J J 12.)

13. Sheboygan Harbor, Wis.—The depth of water over the bar at the mouth of the Sheboygan River originally did not exceed 7 feet. Prior to the improvement of this harbor by the Government, the town and county of Sheboygan built two parallel piers 1,000 feet long, 175 feet apart, extending into Lake Michigan at the mouth of the Sheboygan River, and dredged between them to a depth of 12 feet. Prior to these improvements practically all the commerce at Sheboygan was carried on over bridge piers. Sheboygan is about 24 miles south of Manitowoc and about 52 miles north of Milwaukee.

The original project, adopted in 1866, provided for extending the piers built by the city and county of Sheboygan to the 13-foot contour and dredging between them to a depth of 13 feet; modified as follows: 1873, for dredging to a depth of 17 feet; 1881, for extending piers to 21-foot contour and a depth of 19 feet at entrance, diminishing to 15 feet at shore line; 1894, for increasing width between piers and for a channel 19 feet deep; 1899, for a breakwater 700 feet long; 1902, for extending both piers and increasing depth of channel to 21 feet. The original project as modified was completed in 1904 with the exception of 100 feet of breakwater. The total amount expended thereon, including maintenance, up to the time of adoption of present project is $575,099.44.

The existing project, adopted by Congress March 2, 1907, provides for maintenance of 21-foot channel and works incident thereto, for extension of north breakwater, for a south breakwater, and for subsequent necessary extensions to each breakwater in general accordance with type plan as set forth in report submitted in House Document No. 62, Fifty-ninth Congress, first session. In annual report for 1911, it is recommended that the work in the immediate future be confined to extending the north breakwater shoreward and postponing the construction of a south breakwater until its necessity should be more fully demonstrated. The estimated cost of this partial improvement is $362,000. The river and harbor act of July 25, 1912, adopted this modification of the project and made an appropriation of $125,000 therefor.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth of Sheboygan River	Senate	[1] 175	Twenty-fifth	Second		
Do	do	[1] 42	Thirty-fifth	First		
Project of 1878					1876 [1]	872
Do					1878 [1]	1162
Project of 1881					1881 [1]	2104
Do					1888 [1]	1854
Do					1898 [1]	2734
21-foot channel, project of 1902	House	[1] 327	Fifty-fourth	Second	1897 [1]	2761
Breakwater, project of 1899	do	[1] 58	Fifty-fifth	Third	1899 [2]	2812
Projects of 1899 and 1902					1908 [1]	1854
Report of wave-action board	House	[2] 62	Fifty-ninth	First		
Report of Board of Engineers for Rivers and Harbors.	House committee.	[2] 3	do	Second		
Existing project					1909 [1]	1968

[1] Contains maps.

[2] No maps.

The expenditures during the fiscal year have been for rebuilding inshore portion of south pier, repairs and purchase of plant, dredging for maintenance of channel, and for general supervision.

The amount expended under the existing project up to the close of the fiscal year ending June 30, 1912, was $73,888.98, of which $44,998.67 was for maintenance; of this amount $255.29 was derived from miscellaneous sources.

It is estimated that not more than 5 per cent of the approved project has been completed up to June 30, 1912. No result in the way of increased depth or width has been obtained, but the extension to the breakwater has somewhat diminished the disturbances in the harbor during storms. The maximum draft that could be carried June 30, 1912, was about 19 feet. The usual mean annual variation of level of water surface is about 1 foot. Connecting with the westerly end of the Government improvement, Sheboygan River is navigable for a distance of 1½ miles.

Commercial statistics for 1911.—Total number of vessels, 598; shipments and receipts, 661,886 short tons; approximate valuation, $8,299,425.

The commerce of Sheboygan is quite large and of a general character. It is believed that the project has a material effect in controlling freight rates not only on coal and other bulk commodities, both local and for transshipment, but also in affording to Sheboygan the rail rates accorded places at which water competition exists.

It is proposed to expend the amount recommended for expenditure in fiscal year ending June 30, 1914, in completing the partial improvement recommended in annual report for 1911 and adopted by the act of 1912.

July 1, 1911, balance unexpended	$31,359.27
Miscellaneous receipts	49.61
	31,408.88
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	15,822.55

July 1, 1912, balance unexpended	$15,586.33
July 1, 1912, outstanding liabilities	4.17
July 1, 1912, balance available	15,582.16
Amount appropriated by river and harbor act approved July 25, 1912	127,000.00
Amount available for fiscal year ending June 30, 1913	142,582.16
Amount (estimated) required to be appropriated for completion of existing partial project	[1] 237,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 237,000.00

(See Appendix J J 13.)

14. Port Washington Harbor, Wis.—The natural channel at the mouth of the Sauk River was narrow, and at the shoalest point had a depth of 1 foot, and no harbor existed at this place. All commerce was transacted over bridge piers. Port Washington is about 25 miles north of Milwaukee and about 27 miles south of Sheboygan, Wis.

The original project, adopted in 1869, provided for a channel 14 feet deep between parallel piers 200 feet apart and the excavation and revetment of the west basin, modified as follows: 1870, width between piers reduced to 150 feet; 1876, provided for north basin, depth of channel and basins to be 13 feet. The original project, as modified, was completed in 1895, at a cost of $188,563.33. Since then all expenditures have been for maintenance. The total amount expended up to the date of adoption of the present project is $203,686.79.

The existing project, adopted by act of June 25, 1910, provides for increasing the depth in channel and basins to 18 feet below datum, in accordance with plan printed in House Document No. 306, Sixty-second Congress, second session, at an estimated cost of $30,000; estimated cost of dredging for maintenance, $2,500 annually. There has been no modification of the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Part.	Page.
Entrance channel and basins, project of 1876.					1876 [2]	II	380
Do					1878 [2]		1164
Do					1879 [2]		1580
Do					1881 [2]		2110
Do					1893 [2]		2740
Increasing depth and breakwater, preliminary examination.	House	[3] 44	Fifty-sixth	First	1900 [3]		3766
Entrance channel and basins, project of 1876.					1903 [2]		1856
Increasing depth and harbor facilities, preliminary examination.	House	[3] 227	Fifty-eighth	Second	1904 [3]		2599
Increasing depth to 18 feet, existing project.	do	[3] 306	Sixty-first	do			

[1] Exclusive of amount available for fiscal year 1913. [2] Contains maps. [3] No maps.

The expenditures during the fiscal year have been for dredging for maintenance of channel, for minor repairs to piers, repairs and purchase of plant, and for general supervision.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $31,713.21, of which $9,266.91 was applied to maintenance.

The existing project has been completed and the full project depth obtained throughout the harbor. The maximum draft that could be carried June 30, 1912, was about 16½ feet. The usual mean annual variation of levels of water surface is about 1 foot.

Commercial statistics for 1911.—Total number of vessels, 163; shipments and receipts, 10,362 short tons; approximate valuation, $248,700.

The commerce benefited is small in volume and of a local character. It is believed that the project has a considerable effect in controlling freight rates, not only in coal for local consumption brought in by way of the harbor, but also in affording Port Washington the rail rates accorded places where water competition exists.

It is proposed to expend the amount recommended for expenditure in fiscal year ending June 30, 1914, in dredging for maintenance of channel and minor repairs to piers.

July 1, 1911, balance unexpended	$5,399.76
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,831.51
July 1, 1912, balance unexpended	3,568.25
Amount appropriated by river and harbor act approved July 25, 1912	2,500.00
Amount available for fiscal year ending June 30, 1913	6,068.25
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]4,500.00

(See Appendix J J 14.)

15. Milwaukee Harbor, Wis., including harbor of refuge.—Milwaukee Harbor and the harbor of refuge, which were originally separate works, were consolidated by the act of June 13, 1902.

The original depth of water at the mouth of the Milwaukee River was not more than 4½ feet, and no harbor existed at this place. Milwaukee is about 85 miles north of Chicago and about 85 miles west of Grand Haven, Mich.

The original project for the improvement of Milwaukee Harbor was adopted in 1845–46, and provided for dredging the original river mouth and protecting the entrance by parallel piers, modified as follows: 1852, provided for the formation of a channel 260 feet wide and 13 feet deep, located 3,000 feet to the northward of original mouth of the Milwaukee River, by dredging across the overlapping point and protecting the channel by parallel piers, each 1,120 feet long; 1868, provided for extending each pier 600 feet; 1899, provided for deepening the channel to 21 feet; 1902, provided for concrete superstructure on 1,050 feet of the north pier; 1905, provided for completing concrete superstructure on north pier, a distance of 600 feet.

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[1] Exclusive of amount available for fiscal year 1913.

The original project for the harbor of refuge was adopted in 1881 and provided for a breakwater 7,650 feet long, including an opening therein of 400 feet; the acts of 1902 and 1905 provided for concrete superstructure on 3,450 feet of the northern end of the breakwater.

These original projects as modified were completed in 1906. The total amount expended thereon, including maintenance up to the time of adoption of the present project, is $1,739,040.88.

The existing project, adopted by the river and harbor act of March 2, 1907, provides for maintenance of 21-foot channel, rebuilding south pier, building 3,800 feet of concrete superstructure on breakwater, and extending the breakwater 1,000 feet. Estimated cost, $592,000. There has been no modification of this project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth of Milwaukee River	Senate	[1] 175	Twenty-fifth	Second		
Project of 1868					1878 [1]	1196
Breakwater	House	[1] 48	Forty-sixth	Third	1881 [2]	2116
Harbor of refuge, project of 1881					1883 [1]	1706
Harbor of refuge and harbor entrance.					1884 [1]	1564
Harbor entrance, project of 1868					1884 [1]	1886
Harbor of refuge and harbor entrance.					1885 [1]	2016
Harbor entrance, project of 1868					1893 [1]	2748
Harbor entrance, project of 1899	House	[2] 61	Fifty-fourth	Second	1897 [2]	2785
Shore end of breakwater					1897 [1]	2690
Outer harbor, preliminary examination.	House	[2] 86	Fifty-sixth	Second	1901 [2]	2861
Harbor of refuge and harbor entrance.					1903 [1]	1868
Inner harbor, also harbor of refuge and harbor entrance.	House	[1] 120	Fifty-eighth	Second	1904 [2]	2885
Harbor entrance, new south pier					1906 [1]	1734
Outer and inner harbors	House	[1] 667	Sixty-first	Second		
Harbor of refuge and rivers					1911 [1]	2332

[1] Contains maps. [2] No maps.

The expenditures during the fiscal year have been for repairs and purchase of plant, for timber purchased for general repairs and stored at Kewaunee, Wis., and for general supervision.

The amount expended under the existing project up to the close of the fiscal year ending June 30, 1912, was $612,540.90, of which $506,691.92 was for maintenance. Of this amount $167.07 was derived from miscellaneous sources. There was received during the year for timber used at various harbors in this district, purchased from appropriation for improving harbor at Milwaukee, Wis., $6,267.95.

The existing project was completed in 1910. The maximum draft that could be carried June 30, 1912, was 20 feet. The mean annual variation of level of water surface is about 1 foot.

Commercial statistics for 1911.—Total number of vessels, 5,871; shipments and receipts, 7,612,241 short tons; approximate valuation, $119,653,735.

Milwaukee stands among the leading lake ports in the extent and value of its water-borne commerce. About 4,860,000 tons of coal was brought to Milwaukee in 1911, to be locally consumed or distributed to points in the interior. By means of car ferries, which ply both winter and summer, Milwaukee is connected with several railway systems terminating on the east shore of Lake Michigan.

By reason of its excellent harbor the manufacturers and distributers of Milwaukee enjoy superior shipping facilities and low freight rates, especially to and from eastern points. Many bulky articles, such as coal, salt, sugar, etc., are transshipped from water to rail at Milwaukee. The favorable effect of the harbor upon commerce is widespread throughout several States lying to the westward.

July 1, 1911, balance unexpended	$23,284.62
Appropriation credited for stock timber used at various harbors during year	6,267.95
	29,552.57
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	5,258.08
July 1, 1912, balance unexpended	24,294.49
July 1, 1912, outstanding liabilities	4,738.50
July 1, 1912, balance available	19,555.99
July 1, 1912, amount covered by uncompleted contracts	2,424.65

(See Appendix J J 15.)

16. Milwaukee (inner) Harbor, Wis.—The original condition of the rivers comprised in the inner harbor of Milwaukee is not definitely known. These rivers have been dredged, and a depth of about 21 feet below datum maintained therein, by the city of Milwaukee.

The original, which is the existing, project was adopted by act of March 3, 1905, and provided for improving Menomonee, Milwaukee, and Kinnickinnick Rivers, which constitute the inner harbor of Milwaukee. This project provides for the excavation of four turning basins—one in the Menomonee and three in the Kinnickinnick; the excavation of a channel 100 feet wide from the turning basin in Menomonee River to its mouth and 150 feet wide thence to the harbor entrance; the excavation of a channel 100 to 150 feet wide from the mouth of the Kinnickinnick to the uppermost turning basin in that river, all channels to be 21 feet deep. The estimated cost of this improvement is $318,581. The act in adopting the project provided that no part of the appropriation therefor should be expended unless the Secretary of War shall have satisfactory assurance that the city of Milwaukee will comply with certain conditions. Stated briefly, the city must donate the land for the turning basins, must revet channels and basins wherever necessary, and must maintain the improvement after its completion.

By act approved June 30, 1906, Congress authorized the Secretary of War, in his discretion, to modify this project by omitting the turning basin at the head of navigation in the Kinnickinnick River.

By act approved May 28, 1908, Congress authorized the Secretary of War, in his discretion, to enter into a contract or contracts for the improvement of the Kinnickinnick River, as soon as the city of Milwaukee shall have complied with the foregoing conditions, so far as they apply to the Kinnickinnick River, or any part thereof.

By the river and harbor act approved June 25, 1910, Congress authorized the diversion of balances remaining of amounts heretofore appropriated and authorized for purpose of widening channels along Jones Island and for dredging at certain points in the Menomonee River so as to make said river more available for purposes of commerce; provided that said diversion shall not be made until the Secretary of War is satisfied that the conditions recommended as precedent thereto have been complied with by the city of Milwaukee, in accordance with plan printed in House Document No. 667, Sixty-first Congress, second session.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Rivers at Milwaukee, also harbor of refuge and harbor entrance.	House	[1] 120	Fifty-eighth	Second	1904 [2]	2887
Do	do	[1] 667	Sixty-first	do		

[1] Contains maps. [2] No maps.

There has been no expenditure under the existing project. While the city of Milwaukee has donated a portion of the land required and has fulfilled the other conditions mentioned, the land necessary for the lower turning basin at the mouth of the Kinnickinnick River and for widening certain portions of the Menomonee River has not yet been donated to the United States. The acquisition of this land by the United States is necessary before beginning operations.

The work is to be done under continuing-contract appropriations, and the balance of the authorization to be appropriated is $218,581.

No portion of the approved project had been accomplished up to June 30, 1912.

The maximum draft which could be carried June 30, 1912, was about 20 feet. The usual mean annual variation of water surface is about 1 foot. The rivers are actually navigable as follows: Milwaukee River, about 2¾ miles; Menomonee River, about 2 miles; Kinnickinnick River, about 2¼ miles.

The commerce of Milwaukee has already been described in the report relating to Milwaukee Harbor.

It is believed that the project will have a material effect in controlling freight rates on bulk commodities, such as coal, grain, and ore, both locally and for transshipment. It is impracticable to estimate the amount of reduction in rates thereby effected.

July 1, 1911, balance unexpended	$100,000
July 1, 1912, balance unexpended	100,000
Amount of continuing contract authorization, act of Mar. 3, 1905	218,581
Amount yet to be appropriated	218,581
Amount (estimated) required to be appropriated for completion of existing project	[1] 218,581

(See Appendix J J 16.)

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[1] Exclusive of the balance unexpended July 1, 1912.

17. Racine Harbor, Wis.—The original depth of water at the mouth of the Root River varied from absolute closure after storms to about 7 feet, and no harbor existed at this place. Racine is about 23 miles south of Milwaukee and about 62 miles north of Chicago.

The original project, adopted in 1842–43, provided for a channel 13 feet deep between parallel piers 160 feet apart, modified as follows: 1866, provided for increasing depth to 16 feet and for extension of piers; 1889, provided for increasing depth to 17 feet and for further extension of piers; 1899, provided for widening channel and increasing depth to 21 feet, for extending the south pier, and for a breakwater 600 feet long; 1902, provided for a change in the location and direction of the breakwater. The original project as modified was completed in 1905. The total amount expended thereon, including maintenance up to the time of adoption of present project, is $507,141.72.

The existing project, adopted by act of March 2, 1907, provides for maintenance of 21-foot channel and works incident thereto, for extension of north breakwater, for a south breakwater, and for subsequent necessary extensions to each breakwater, in general accordance with type plan as set forth in report submitted in House Document No. 62, Fifty-ninth Congress, first session. An estimate of the cost of part of this project, amounting to $243,000, was published in Annual Report for 1909, page 1974, and the river and harbor act of June 25, 1910, made an appropriation of this sum for maintenance and continuing improvement. There has been no modification of the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth of Root River	Senate	[1] 175	Twenty-fifth	Second		
Project of 1866					1883 [1]	1707
Do					1884 [1]	1868
Do					1885 [1]	2020
Enlarging and deepening channel (preliminary examination).					1889 [2]	2108
Project of 1889					1893 [1]	2750
Project of 1899, 21-foot channel	House	[1] 326	Fifty-fourth	Second	1897 [1]	2768
Project of 1889					1898 [1]	2332
Breakwater, project of 1899	House	[1] 165	Fifty-fifth	Third	1899 [2]	2815
Project of 1899					1903 [1]	1862
Do					1905 [1]	2044
Report of Wave Action Board	House	[2] 62	Fifty-ninth	First		
Report of Board of Engineers for Rivers and Harbors.	House committee.	[2] 3	do	Second		
Existing project					1909 [1]	1974

[1] Contains maps. [2] No maps.

The expenditures during the fiscal year have been for breakwater extension, for repairs and purchase of plant, and for general supervision.

The total amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, is $125,979.57, of which amount $38,266.40 was for maintenance.

It is estimated that about 25 per cent of the approved project has been completed up to June 30, 1912. No result in the way of increased depth or width has been obtained, but the extension to the breakwater has somewhat diminished the disturbances in the harbor during storms.

The maximum draft that could be carried June 30, 1912, was about 17½ feet. The usual mean annual variation of level of water surface is about 1 foot. Connecting with the western terminus of the Government improvement, Root River is navigable for a distance of about nine-tenths of a mile.

Commercial statistics for 1911.—Total number of vessels, 1,549; shipments and receipts, 197,667 short tons; approximate valuation, $6,855,400.

The commerce benefited is quite large in volume and of a general character.

It is believed that the project has a material effect in controlling freight rates, not only on coal and other bulk commodities, both local and for transshipment, but also in affording Racine the rail rates accorded places at which water competition exists.

The extension of the north breakwater is now under construction and will be completed with the funds available.

July 1, 1911, balance unexpended		$223, 213. 54
Reimbursement to appropriation from Isthmian Canal Commission		2. 25
Miscellaneous receipts		1. 35
		223, 217. 14
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$45, 516. 98	
For maintenance of improvement	1, 685. 63	
		47, 202. 61
July 1, 1912, balance unexpended		176, 014. 53
July 1, 1912, outstanding liabilities		403. 85
July 1, 1912, balance available		175, 610. 68
July 1, 1912, amount covered by uncompleted contracts		123, 060. 92

(See Appendix J J 17.)

18. Kenosha Harbor, Wis.—The original depth of water at the mouth of Pike Creek varied from nothing to 4 feet, and no harbor existed at this place.

The original project, adopted in 1852, provided for a channel 13 feet deep between parallel piers 150 feet apart, modified as follows: 1866, provided for a navigable channel 16 feet deep; 1889, provided for extending north pier 300 feet and south pier 600 feet, and for channel 16 feet deep; 1890, provided for dredging in "The Basin"; 1899, provided for extending the south pier, increasing the width between piers to 250 feet by rebuilding the north pier, building 600 feet to breakwater, and increasing the depth in channel and basin to 21 feet and 20 feet, respectively; 1902, provided for extending the breakwater 100 feet shoreward. The original project as modified was completed in 1900, with the exception of 100 feet extension to breakwater. The total amount expended thereon, including maintenance up to the time of adoption of present project, is $475,815.37.

The existing project, adopted by Congress March 2, 1907, provides for maintenance of 21-foot entrance channel, 20-foot basin, and existing works, and for an extension of 200 feet to the landward end of the breakwater. Estimated cost, $22,000.

There has been no modification of the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth of Pike Creek	Senate	103	Twenty-fifth	Second		
Do	do	42	Thirty-fifth	First		
Harbor entrance and basin					1878 [1]	1168
Do					1884 [1]	1870
Do					1885 [1]	2022
Harbor of refuge (preliminary examination).					1889 [2]	2108
Harbor entrance and basin					1893 [1]	2752
Harbor entrance and basin, 21-foot channel, project of 1899.	House	[1] 328	Fifty-fourth	Second	1897 [1]	2772
Breakwater, project of 1899	do	[1] 164	Fifty-fifth	Third	1899 [2]	2817
Enlarging basin (preliminary examination).	do	[2] 46	Fifty-sixth	First	1900 [2]	3767
Land donated for enlargement of harbor.	do	[2] 153	do	Second		
Harbor entrance and basin					1908 [1]	1868
Report of Wave Action Board	House	[2] 62	Fifty-ninth	First		
Report of Board of Engineers for Rivers and Harbors.	House committee.	[2] 3	do	Second		

[1] Contains maps. [2] No maps.

There have been no operations during the fiscal year. The expenditures have been for repairs and purchase of plant and for general supervision.

The total amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, is $57,314.47. Of this amount $26,891.44 was for maintenance. Of this amount $4.30 was derived from miscellaneous sources.

The existing project was completed in 1909.

The maximum draft that could be carried June 30, 1912, was about 16 feet. The usual mean annual variation of level of water surface is about 1 foot. Connecting with the western terminus of the Government improvement, Pike Creek is navigable for a distance of about 2,500 feet.

Commercial statistics for 1911.—Total number of vessels, 510; shipments and receipts, 80,731 short tons; approximate valuation, $4,985,330.

The commerce is not large in volume and is chiefly of a local character.

It is believed that the project has a considerable effect in controlling freight rates, not only on coal for local consumption brought in by way of the harbor but also by affording Kenosha the rail rates accorded places at which water competition exists.

It is proposed to apply the amount recommended for expenditure in fiscal year ending June 30, 1914, in repairs of piers and breakwater and in dredging for maintenance of channel. The work proposed is necessary for maintenance of the harbor.

July 1, 1911, balance unexpended	$18,885.26
Miscellaneous receipts	3.50
	18,888.76
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,049.18
July 1, 1912, balance unexpended	16,839.58
July 1, 1912, outstanding liabilities	1,360.00
July 1, 1912, balance available	15,479.58
Amount appropriated by river and harbor act approved July 25, 1912	15,000.00
Amount available for fiscal year ending June 30, 1913	30,479.58
July 1, 1912, amount covered by uncompleted contracts	2,670.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 24,000.00

(See Appendix J J 18.)

19. Waukegan Harbor, Ill.—Originally there was no navigable channel or natural harbor at this place. Waukegan is about 49 miles south of Milwaukee and about 36 miles north of Chicago.

An appropriation of $15,000 was made in 1852 "for the improvement of the harbor and breakwater at Waukegan, Ill." The plan adopted was the construction of a breakwater parallel to the shore in about 20 feet of water and opposite the heads of two bridge piers in the open lake, from which the commerce of the place was carried on. One crib was placed in position but was carried away by a storm, and the work was abandoned.

The original project was adopted in 1880 and provided for an artificial harbor of sufficient capacity for local trade by inclosing an area with pile piers, the entrance channel and inclosed area to be dredged to 13 feet. The amount expended on original project was $218,944.41.

The existing project, adopted by act of June 13, 1902, provides for extending both harbor piers, building a breakwater, and increasing depth of channel to 20 feet; estimated cost, $345,000. There has been no modification of the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Not known	Senate	16	Thirty-fourth	First		
Breakwater	do	42	Thirty-fifth	do		
Harbor of refuge, breakwater					1873 [2]	267
Project of 1880					1880 [2]	1912
Do					1883 [3]	1719
Do					1884 [2]	1871
Do					1885 [3]	[illegible]
Do					1889 [2]	[illegible]
Existing project, June 13, 1902	House	[2] 343	Fifty-sixth	First	1900 [2]	[illegible]
Do					1905 [3]	[illegible]
Do					1906 [2]	1769

[1] Exclusive of amount available for fiscal year 1913. [2] No maps. [3] Contains maps.

The expenditures during the fiscal year have been for dredging for maintenance of channel, purchase and repairs of plant, and for general supervision.

The total amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, is $443,117.42. Of this sum $132,778.03 was for maintenance, of which amount $296.76 was derived from miscellaneous sources.

The approved project was completed in 1904. Since then all expenditures have been for maintenance.

The maximum draft which could be carried June 30, 1912, was about 19 feet. The usual mean annual variation of water level is about 1 foot.

Commercial statistics for 1911.—Total number of vessels, 1,142; shipments and receipts, 213,925 short tons; approximate valuation, $2,085,220.

The commerce affected by the project is mostly coal and salt for transshipment.

It is believed that the harbor is of great convenience to general commerce, being a terminus of the Elgin, Joliet & Eastern Railway, known as the Chicago Outer Belt Line. The harbor is in close connection with all the railways entering Chicago.

It is believed that the project has a considerable effect in controlling freight rates on coal and other bulk commodities.

It is proposed to apply the amount recommended for expenditure in fiscal year ending June 30, 1914, in repairs of piers and breakwater and dredging. The work proposed is necessary for maintenance of the harbor.

July 1, 1911, balance unexpended	$19,831.83
Miscellaneous receipts	25.00
	19,856.83
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	11,121.90
July 1, 1912, balance unexpended	8,734.93
July 1, 1912, outstanding liabilities	1,965.86
July 1, 1912, balance available	6,769.07
Amount appropriated by river and harbor act approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	11,769.07
July 1, 1912, amount covered by uncompleted contracts	3,560.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 18,500.00

(See Appendix J J 19.)

20. Fox River, Wis.—The Fox and Wisconsin Rivers, separated at Portage, Wis., by a distance of only 2 miles, one flowing into Lake Michigan, the other into the Mississippi River, were the early means of communication between those waters. Through a board of public works the State began and carried on the improvement until 1853, when it was transferred to a private company. In 1872 the United States purchased from the Green Bay & Mississippi Canal Co. all of its property except the water powers, water-power lots, and personal property.

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[1] Exclusive of amount available for fiscal year 1913.

The Fox River rises in Columbia County, Wis., and flows in a generally northerly direction, emptying into the head of Green Bay. The total length of the river is 176 miles. The length of the particular section included in the project, being from Portage to Green Bay, is 163 miles, including a canal 2 miles in length from the Wisconsin River to the Fox River at Portage. The lower end of the section under improvement is 7 miles from the mouth of the river.

The Wolf River is a tributary of the Fox River and rises in the northerly part of Langlade County, Wis., and flows in a generally southerly direction about 220 miles, emptying into the Fox River about 12 miles above Oshkosh. The particular section of the river included in the project, being from Shawano to the mouth of the river, is about 126 miles in length.

The present project is that of a board of engineers, submitted September 17, 1884, and modified May 14, 1886. It provides for deepening and widening the channel of Fox River from Green Bay to Montello to 6 feet depth and from Montello to Portage to 4 feet depth, with a width of the river channel from Lake Winnebago to Montello of 100 feet, and for the renovation of 12 old locks, at an estimated cost of $602,000.

Appropriations aggregating $618,750 have been provided for this work, and a revision of the estimate indicates that $130,353.36 will be required to complete it.

The river and harbor act of June 25, 1910, appropriated $25,000 for continuing improvement from Depere up to Portage, and provided that $3,000, or so much thereof as may be necessary of said appropriation, shall be used in removing bars and snags and otherwise improving Wolf River.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Part.	Page.
Entire river (Pettival)	House	102	Twenty-fifth	Third			
Entire river (Oram)	Senate	318	Twenty-sixth	First			
Report of arbitrators	House	[1] 185	Forty-second	Second			
Entire river (Houston)	do	[1] 111	do	Third			
Entire river (Warren)	Senate	[2] 28	Forty-fourth	First	1876 [2]	II	189
Flowage damages	do	[1] 17	do	Second			
Money expended by Government	do	[1] 81	Forty-fifth	do			
Excessive flowage damages (Attorney General)	House	[1] 51	do	Third			
Wolf river, entire river					1879 [2]		1552
Wolf River, Lake Poygan to Red River					1880 [1]		1978
Lake Winnebago	Senate	[2] 58	Forty-seventh	First			
Menasha Dam	House	[2] 93	do	do			
Lake Winnebago					1882 [1]		2182
Flowage damages	Senate	[2] 92	Forty-eighth	First	1884		1882
Entire river					1884 [2]		1899
Flowage damages					1885 [1]		2041
Fond du Lac Harbor and Lake Winnebago	House	[2] 24	Fifty-first	First	1890 [1]		2289

[1] No maps.

[2] Contains maps.

References to examination or survey reports and maps or plans not in project documents—Continued.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Part.	Page.
Rules and regulations	House	[1] 152	Fifty-first	Second			
Stockbridge Harbor, Lake Winnebago	do	[1] 78	Fifty-second	do	1893 [1]		2782
Calumet Harbor, Lake Winnebago	do	[1] 117	do	do	1893 [1]		2783
Entire river					1897 [2]		2750
Stockbridge Harbor, Lake Winnebago					1898 [2]		2349
Entire river—United States property (Bragg)	House	[2] 389	Fifty-fifth	Second	1898 [1]		2355
High Cliff Harbor, Lake Winnebago	do	[1] 356	Sixty-first	do			
Waupaca River	do	[1] 20	Sixty-second	do			

[1] No maps.

[2] Contains maps.

The expenditures during the fiscal year have been for dredging above Princeton Lock, dredging and snagging on Wolf River, repairs and renovation of plant, and for general supervision.

The amount expended by the United States on the improvement of the Fox and Wisconsin Rivers from 1839 (date of first appropriation) to the close of the fiscal year ending June 30, 1912, including about $600,000 expended for flowage damages and $145,000 paid to the Green Bay & Mississippi Canal Co. for its property, was $3,865,217.65, of which amount $591,161.39 was expended solely upon the Wisconsin River. The improvement of the Wisconsin River was abandoned in 1887.

The works on Fox River now consist of 18 stone locks, 2 stone guard locks, and 8 composite locks, 13 canals, 16 permanent and 1 temporary dam, and various accessories, including lock houses, warehouses, a dry dock, levees, wasteweirs, culverts, retaining walls, etc. The harbors of Stockbridge, Calumet, Miller Bay, and Brothertown, Lake Winnebago, have been improved, and snags have been removed and bars dredged in Wolf River, making a 4-foot channel 100 feet wide to New London.

The project depth of 6 feet below mean low water has for the most part been obtained from Depere to Princeton Lock, but the revision of the estimate indicates that there is still a large amount of dredging to be done in the levels between Butte des Morts and Princeton Lock where now but 5-foot depths obtain. The dredging of the 6-foot channel between Princeton Lock and Montello is now in progress.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the improvement was 5 feet from Depere to Berlin Lock, 4 feet from there to milepost 70 (about 17 miles above Princeton Lock), and 3 feet from milepost 70 to Portage, the head of navigation on the Fox River.

Commercial statistics for 1911.—Total number of vessels engaged in commerce on the river, 43; shipments and receipts, 170,313 short tons; approximate valuation, $736,617.

It is proposed to apply the amount recommended for expenditure in fiscal year ending June 30, 1914, in dredging between Princeton and Montello Locks in furtherance of existing project, and for maintenance of improvement of Wolf River and of harbors on Lake Winnebago.

July 1, 1911, balance unexpended		$34,101.06
Miscellaneous receipts		262.94
		34,364.00
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$11,957.63	
For maintenance of improvement	5,717.47	
		17,675.10
July 1, 1912, balance unexpended		16,688.90
July 1, 1912, outstanding liabilities		973.19
July 1, 1912, balance available		15,715.71
Amount (estimated) required to be appropriated for completion of existing project		[1]130,353.36
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1]20,000.00

(See Appendix J J 20.)

21. Operating and care of locks and dams on Fox River, Wis.—Under the allotment from the indefinite appropriation for operating and care of canals and other works of navigation there has been expended during the fiscal year ending June 30, 1912, the sum of $56,206.67.

The amount expended to June 30, 1912, is $1,569,983.17, including $3,401.23 miscellaneous receipts.

The work done has consisted of dredging bars and channels, making repairs to locks, dams, canal banks, lock houses, and floating plant, building a lock house at Depere lock, building a new coal barge, and general supervision.

The report of the district engineer officer in charge shows the items of expenditures. Navigation was closed November 20, 1911, and reopened April 18, 1912.

For commercial statistics see report of the district officer upon the improvement of Fox River, Wis.

(See Appendix J J 21.)

22. Removing sunken vessels or craft obstructing or endangering navigation.—Wreck of car ferry steamer Ann Arbor No. 1 in Manitowoc Harbor, Wis.—This vessel burned in the slip at Manitowoc Harbor early in March, 1910. The burned vessel was towed out into the harbor and permitted to sink alongside the south breakwater near the outer end.

The wreck as it thus lay was a menace to navigation and might have become a serious obstruction in the channel.

Under the provisions of section 19 of the river and harbor act of March 3, 1899, and by direction of the Chief of Engineers, the destruction and removal of this wreck was authorized July 30, 1910.

Proposals for its removal were advertised, but prior to the opening of bids the Ann Arbor Railway Co., the owner of the wrecked vessel, agreed to remove the wrecked vessel at its own expense, and furnished a bond of indemnity to the United States of $5,000.

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[1] Exclusive of the balance unexpended July 1, 1912.

The wreck was entirely removed at the expense of the said Ann Arbor Railway Co. in July, 1911.

The total cost to the United States for the removal of this wreck was $100 to cover expenses incurred for inspection, sweeping the site of the work, etc., and was paid from an allotment from the appropriation for removing sunken vessels or craft obstructing or endangering navigation.

(See Appendix J J 22.)

EXAMINATIONS AND SURVEYS REQUIRED BY THE RIVER AND HARBOR ACTS APPROVED JUNE 25, 1910, AND FEBRUARY 27, 1911.

The local officer was also charged with the duty of making preliminary examinations and surveys, provided for by the river and harbor acts approved June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. *Two Rivers, Wis.*, with a view to the further improvement of said harbor by the construction of a south stilling basin, or otherwise.

2. *Manitowoc Harbor and river, Wis.*, with a view to their further improvement to meet the demands of commerce by the deepening of said river and by the enlargement of the dredged area of the basin inside the breakwaters, or otherwise; also with a view to the creation of a harbor of refuge within said river and basin.

IMPROVEMENTS OF RIVERS AND HARBORS IN THE CHICAGO, ILL., DISTRICT.

This district was in the charge of Lieut. Col. George A. Zinn, Corps of Engineers. Division Engineers, Lakes Division, Col. C. McD. Townsend, Corps of Engineers, and Western Division, Lieut. Col. Charles L. Potter, Corps of Engineers.

1. *Chicago Harbor, Ill.*—The inner basin of this harbor covering an area of 270 acres, is formed by the easterly breakwater, 4,036 feet long, and the southerly breakwater about 3,000 feet long. The entrance to this basin and to Chicago Harbor is protected by an exterior breakwater 5,413 feet long, located in Lake Michigan about three-fourths mile northeast from the entrance of Chicago Harbor. The harbor is distant 34⅛ miles in a southerly direction from Waukegan Harbor, Ill., and 12½ miles in a northerly direction from Calumet Harbor, Ill.

All depths are referred to low water of 1847, or the so-called "Chicago city datum," which is 579.94 feet above mean tide, New York Harbor. The maximum draft that can be carried at mean low water is 20 feet.

The water level has a total variation of about 6.5 feet from highest known to lowest known water, and an average of less than 1 foot oscillation per day.

Before improvement by the United States the Chicago River made a sharp bend southward just before reaching Lake Michigan, and had its outlet fully half a mile from its present mouth, leaving between the river and the lake a long sand bar. The depth at the entrance was only about 3 to 4 feet.

The improvement at Chicago Harbor was commenced in 1833 by cutting through this bar, to give the river a straight outlet, and by constructing piers on the north and south sides of the river. These piers were extended from time to time and the channel maintained by dredging. Previous to 1870 the harbor was limited to the lower end of Chicago River, with an entrance channel width of 400 feet and depth of 13 feet and annual commerce less than 3,000,000 tons. A brief history of this harbor improvement prior to 1876 is given on pages 433 to 438, part 2, Annual Report of the Chief of Engineers for 1876, and a very full description of the harbor in its improved condition is to be found on pages 164 to 167, Bulletin No. 21 (1912), issued by the United States Lake Survey Office, Detroit, Mich.

There was expended on the work prior to operations under the existing project of 1870 and its modifications $446.005.

The present project adopted in 1870, was modified in 1878, 1896, 1903, and 1905; that for present increased depth of dredging in outer harbor being given by report of July 16, 1897 (p. 2791, Annual Report of the Chief of Engineers for 1897), specifically adopted by act of March 3, 1899; and that for repair of north pier being given by report of July 14, 1903 (p. 1888, Annual Report of the Chief of Engineers for 1903), adopted by act of March 3, 1905; such projects including:

(*a*) Breakwaters to form an outer harbor, with dredging within the same for 20-foot draft (21-foot depth).

(*b*) Exterior breakwater, with a harbor of refuge behind the same.

(*c*) Dredging entrance to inner harbor or mouth of Chicago River to same depth as outer harbor.

(*d*) Maintenance.

There has been expended on the project of 1870, with its modifications, to June 30, 1912, the sum of $2,126,554.39, of which $140,638.35 has been for maintenance since 1903.

The work done during the year was the partial repair of piers and breakwaters where damaged by storms, and dredging at harbor entrance.

The project has been completed, except the dredging of the westerly portion of the outer harbor basin for 20-foot draft and necessary maintenance of the harbor works.

The work of improvement has resulted in the widening and deepening of the inner harbor (entrance to Chicago River) by erecting piers on either side of the river and dredging between them until it has now a width ranging from 470 feet at its lake end to about 200 feet at its river end, and a depth of 21 feet; the formation of an outer harbor basin south of the entrance to Chicago River by inclosing within breakwaters about 270 acres of the area of Lake Michigan, the basin having a depth of 21 feet over its easterly portion and 10 to 14 feet over its westerly portion; and the erection of an exterior breakwater about 1 mile north of the entrance to the river to shelter said entrance and the outer harbor from northerly storms and to form a harbor of refuge.

Chicago outer harbor, being mainly a protection to Chicago River entrance, has practically no commerce except that of the river, the outer basin being used mainly by yachts and other small craft. The lake commerce of Chicago, after having risen to more than 8,000,000 short tons in 1892, diminished to 4,025,000 short tons in 1908, and in

1911 was 4,025,576 short tons, and the harbor works, while formerly having added about 5,000,000 tons to the river commerce, are now needed mainly to prevent a further loss of the 4,000,000 tons remaining.

The existence of this improved harbor is considered to be of great use in controlling freight rates.

The rebuilding of the easterly and southerly breakwatérs, in concrete, has been authorized, and funds provided, but the work has been postponed on account of contemplated improvements on the lake front by the city and park commissioners embodying a modification of the existing harbor lines.

It is proposed to apply the available funds, together with those asked for, to the maintenance of existing works, rebuilding in concrete the superstructure of the easterly and southerly breakwaters and the south harbor pier, which is in a very dilapidated condition and requires rebuilding, and in the extension and construction of breakwaters to form an outer harbor behind the existing exterior breakwater.

For map of full improvement, see page 1888, Annual Report of the Chief of Engineers for 1903.

No preliminary examination reports appear to be on record as to past improvements of this locality.

A list of past survey reports will be found on page 600, Annual Report of the Chief of Engineers for 1906.

The examination and survey of harbors and rivers in the Chicago District for the purpose of reporting a plan for a complete, systematic, and broad improvement of harbor facilities for Chicago and adjacent territory was made and report thereon submitted and published as House Document No. 710, Sixty-second Congress, second session.

This document presents a project for the extension and construction of breakwaters to secure an outer harbor behind the existing exterior breakwater, at an estimated cost of $1,211,195, which was specifically adopted by Congress in the river and harbor act approved July 25, 1912. This act carries an appropriation of $350,000, with the proviso that the work shall not be commenced until assurances satisfactory to the Secretary of War shall have been received that the work contemplated by the city of Chicago as a part of said improvement will be actually undertaken by the city.

July 1, 1911, balance unexpended	$265, 506. 99
Refunded by Isthmian Canal Commission ("for Chicago River")	900. 81
Received from sale of property	3. 25
	266, 411. 05
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	9, 124. 92
July 1, 1912, balance unexpended	257, 286. 13
Amount appropriated by sundry civil act approved Aug. 24, 1912	240, 000. 00
Amount appropriated by river and harbor act approved July 25, 1912	350, 000. 00
Amount available for fiscal year ending June 30, 1913	847, 286. 13
July 1, 1912, amount covered by uncompleted contracts	12, 125. 64
Amount of continuing contract authorization, act of Feb. 27, 1911	240, 000. 00
Amount appropriated under such authorization	240, 000. 00

Amount (estimated) required to be appropriated for completion of existing project	[1] $861,195.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 250,000.00

(See Appendix K K 1.)

2. *Chicago River, Ill.*—This river constitutes the inner harbor of Chicago. The navigable portions are wholly within the limits of Cook County and of the city of Chicago. Originally it was a sluggish bayou or creek nearly stagnant for the greater part of the year. The total length of the main river and its branches is about 20 miles. The portions of the river under improvement by the United States to a depth of 21 feet have lengths as follows:

	Miles.
Main River, from end of harbor piers to junction of North and South Branches	1.58
South Branch, to Ashland Avenue	4.08
South Fork of South Branch, to Chicago Junction railroad bridge (east arm)	1.58
North Branch, to Belmont Avenue	5.00
North Branch Canal (Goose Island cut-off)	1.04
Total	13.28

All depths are referred to Chicago city datum. (See Chicago Harbor report.) Before improvement by the United States (1896) the river channel, as a result of municipal and private improvements, was navigable for about 14-foot draft boats over widths of about 200 feet throughout the length of the main river about 1.5 miles, and of use by boats of 12 to 14 feet draft for lesser widths and for about 5 miles farther length in the North Branch and about 5 miles farther length in the South Branch and forks. A good brief history of river and harbor improvement at Chicago prior to 1876 is given on pages 433–438, part 2, Annual Report of the Chief of Engineers for 1876, and a very full description of present conditions is to be found on pages 167–178, Bulletin No. 21 (1912), issued by the United States Lake Survey Office, Detroit, Mich. For maps of river and turning basins, see pages 1892–1893, annual report, 1903.

Past projects, from 1896 to 1902, provided for 16 feet draft through this river. Under such projects 17 feet actual depth below city datum was secured from the mouth of the river via South Branch and West Fork to Ashland Avenue (about 5.5 miles), via South Branch and South Fork to the stock yards (about 6 miles), and via North Branch to Belmont Avenue (about 6 miles). (See p. 2974, Annual Report of the Chief of Engineers for 1893; p. 2793, report for 1897, and p. 3865, report for 1900, for full reports on history of improvement and needs up to 1899).

The project adopted by the river and harbor act of June 13, 1902, provided for two large turning basins (one in the North Branch and one in the South Branch), to be dredged to 20 feet draft (21 feet depth), at an estimated cost of $500,000. These turning basins have been completely dredged and partly docked, but will need some annual dredging and probably some further dock revetment.

For general description of the sanitary district projects, see page 2097, Annual Report of the Chief of Engineers for 1902.

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[1] Exclusive of amount available for fiscal year 1913.

There has been expended on previous projects $1,028,650.60, of which $109,462.55 was for maintenance.

The existing project was adopted by Congress in the river and harbor act March 2, 1907, which appropriated $300,000 for improvement and maintenance of this river; such work being covered by the survey report of November 14, 1899 (pp. 3865–3871, Annual Report of the Chief of Engineers for 1900), and providing for dredging to 21 feet actual depth in mid-channel and to within 20 feet of dock lines from Ogden Slip at the river mouth to Ashland Avenue on the South Branch, to the Indiana State line (Chicago Junction Railway) bridges on the South Fork, South Branch, and to Belmont Avenue on the North Branch (including also the canal around Goose Island, North Branch), all originally estimated at $810,600. Project covering the work to be done was approved April 11, 1908, as follows:

(*a*) Dredging soft material, main river, North Branch (including canal), South Fork of South Branch, 1,472,000 cubic yards	$384,000
(*b*) Excavation rock and hardpan in North Branch and South Fork, 105,000 cubic yards	352,800
(*c*) Superintendence and inspection	73,800
	810,600

the division of funds between dredging and excavation being subject to modification during the progress of work.

There has been expended on the present project, approved April 11, 1908, to June 30, 1912, $555,130.75, of which $11,143.22 was for maintenance.

The river and harbor act of February 27, 1911, made an appropriation of $34.000 for maintenance and authorized continuing contracts in the further sum of $142,600 for completion of the project, all of which remains to be appropriated.

The work of removing the rock and soft materials in the North Branch in the vicinity of Fullerton Avenue, which was in progress at the beginning of the year, was completed. Work was also in progress under a new contract which provided for the deepening of the channels in the North Branch to North Avenue and in the South Fork to Thirty-fifth Street, in order to restore, as far as permissible with available funds, the project depth of 21 feet in the river.

All the work contemplated in the projects for the improvement of this river has been completed or provided for in the contract except the deepening of the North Branch above North Avenue, in the South Fork above Thirty-fifth Street, and the docking of the North Branch turning basin.

The present condition of the channels, in the main river and its branches, is about as follows, except that more or less shoaling has probably occurred from the various sewers emptying into the river since the soundings of 1911:

In the Main Branch, from Rush Street to the junction of the two branches, there is an available channel of at least 21 feet.

In the North Branch, from the junction to Halsted Street, there is a channel of at least 21 feet; thence to North Avenue (now being dredged to 21 feet) there is from 19 to 20 feet depth. The greater portion of the turning basin is 21 feet deep. The shallow portions are about to be deepened. From North Avenue to Fullerton Avenue there is a governing channel, midstream, of from 17 to 18 feet, though in many stretches deeper—from 20 to 21 feet—but much shallower water is generally found along both sides; but in the rock section from about 100 feet below the bridge to about 1,600 feet above it the depth was made at least 22 feet to within 20 feet of existing docks during the year. From Fullerton Avenue to Belmont Avenue the midstream channel is generally from 16 to 17 feet in depth, decreasing in the vicinity of the latter avenue to between 12 and 13 feet.

In the North Branch Canal the depth from the south end of Goose Island to the turning basin is generally from 19 to 20 feet in midstream, with 2 to 3 feet shallower at the sides.

In the South Branch, from the junction to the South Branch turning basin, the depth is generally nowhere less than 21 or 22 feet, but generally from 24 to 26 feet in depth.

In the South Fork of the South Branch, from Fuller Street to the two railroad bridges at the stock yards, the depth is generally 18 to 19 feet, except in occasional stretches, where from 20 to 23 feet will be found, which is the case at the site for the Thirty-fifth Street bridge, where the rock has been removed by the city of Chicago (preparatory to the construction of the said bridge) to a depth of 23 feet below city datum. The stretch from Fuller Street to Thirty-fifth Street is to be deepened to 23 feet below city datum under exising contract.

The northerly portion of the turning basin has a depth of about 24 feet, but the southerly, or larger, portion has only 18 to 19 feet in depth below hydraulic grade.

The South Branch has been dredged by the sanitary district to a least depth of 26 feet to within 40 feet of the docks, except in some bridge draws.

The maximum draft that can be carried at mean low water is 20 feet through the main river and South Branch to the Sanitary District Channel except through certain bridge draws; 18 feet through the South Fork of South Branch; and in the North Branch (including North Branch Canal) 19 feet to North Avenue.

The water level has variations of about 6.5 feet from the highest known to lowest known water and an average of less than 1 foot per day. The river has a current from the lake toward the Sanitary District Canal varying from nothing up to about 3 miles per hour, according to drainage diversion and lake seiches.

Current observations to determine the exact velocity of the current and of the quantity of water being diverted from Lake Michigan through the Sanitary Canal are now being made.

The annual commerce is now reported at about 4,200,000 short tons. the principal items being grain, lumber, coal, and salt (a good deal of commerce having, since 1897, gone to the Calumet River, and the present further improvement is now mainly needed to prevent further loss). There is quite a large local commerce carried in the Chicago River by lighters, of which no official record is kept.

The development of commerce on this river is greatly hampered by the many obstructive bridges crossing the stream.

The existence of this improved river is considered to be of great use in controlling freight rates.

It is proposed to apply the funds now available and those asked for toward the completion of the turning basins, and to the approved project for dredging.

A list of past survey reports will be found on page 601, Annual Report of the Chief of Engineers for 1906.

Reference to reports on examination and survey of West Fork of South Branch of Chicago River, ordered by the river and harbor act of March 3, 1905, will be found on page 608, Annual Report of the Chief of Engineers for 1906. A report on the same locality called for by the river and harbor act of March 3, 1909, was printed as House Document No. 392, Sixty-first Congress, second session. A new report on same locality was called for by the river and harbor act of June 25, 1910, and report thereon was submitted October 27, 1910, and a public hearing held by the Board of Engineers for Rivers and Harbors September 20, 1911, and will be transmitted to Congress during its next session.

July 1, 1911, balance unexpended		$202,042.92
Less transferred to Chicago Harbor, "For Chicago River"		900.81
		201,142.11
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$113,405.56	
For maintenance of improvement	7,240.59	
		120,646.15
July 1, 1912, balance unexpended		80,495.96
Amount appropriated by sundry civil act approved August 24, 1912		28,000.00
Amount available for fiscal year ending June 30, 1913		108,495.96
July 1, 1912, amount covered by uncompleted contracts		40,329.41
Amount of continuing contract authorization, act of February 27, 1911		142,600.00
Amount appropriated under such authorization		28,000.00
Amount yet to be appropriated		114,600.00
Amount (estimated) required to be appropriated for completion of existing project		[1] 114,600.00
Amount that can be profitably expended in fiscal year ending June 30, 1914:		
For works of improvement		50,000.00
For maintenance of improvement		10,000.00
Total		[1] 60,000.00

(See Appendix K K 2.)

3. Calumet Harbor, Ill.—This harbor lies 12½ miles almost due south from Chicago Harbor, and is known on the Great Lakes as South Chicago Harbor.

Before improvement by the United States the Calumet River made a sharp bend southward just before reaching Lake Michigan and entered the lake about 3,200 feet south of its present mouth, leaving between the river and the lake a sand bar about 400 feet wide. The outlet of the river had been practically closed for many years by a bar which was visible above water at certain stages, the bar being partially cut away during spring freshets, only to be re-formed in the fall.

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[1] Exclusive of amount available for fiscal year 1913.

In 1870 the harbor was limited to the lower end of Calumet River and to the natural depths over the bar at its lake mouth, the channel entrance having about 100 feet available width, with about 3 to 4 feet depth. The annual commerce was practically nothing in either harbor or river. A brief history of this harbor improvement prior to 1876 is given on pages 441–444, part 2, Annual Report of the Chief of Engineers for 1876; and a very full description of present conditions is to be found on pages 182–184, Bulletin No. 21 (1912), issued by the United States Lake Survey Office, Detroit, Mich.

The improvement at Calumet Harbor was designed to furnish a safe and practicable entrance to Calumet River and the port of South Chicago, and was commenced in 1870 by cutting through the bar at the point where the river turned south and by constructing piers on the north and south sides of the river in order to give a straight outlet into the lake. Under past projects, from 1870 to 1895, these piers were built 300 feet apart and parallel to each other, and the channel between them deepened to 16 feet.

All the projected work for 16-foot draft was accomplished prior to June 30, 1896, resulting in the construction of 3,640 linear feet of north pier and 2,020 linear feet of south pier, and securing and maintaining a channel 16 feet deep and of suitable width from water of similar depth in Lake Michigan to the Calumet River at the roots of the piers, at a cost of $454,484.53.

The present project, submitted February 21, 1896, and specifically adopted by Congress by act of March 3, 1899 (including minor changes submitted March 28, 1899, modified July 1, 1902, and approved by Secretary of War July 11, 1902), provides for—

(*a*) A breakwater 4,400 feet long, connected with the shore and running due east into the lake, terminating in water 32 feet deep.

(*b*) An extension of this breakwater 2,500 feet long in a southeasterly direction from the end of the first.

(*c*) The anchorage area sheltered by breakwater dredged to 20 feet draft (21 feet depth).

(*d*) South pier at the mouth of Calumet River extended 800 feet.

(*e*) The Calumet River dredged to a width of 200 feet and 20 feet draft (21 feet depth) for a distance of 2 miles from the mouth.

(*f*) Maintenance.

For text and map, including minor changes, see pages 2583–2588, Annual Report of the Chief of Engineers for 1896, and page 2102 of the report for 1902.

There has been expended on the present project of 1896, adopted in 1899, to June 30, 1912, $1,043,402.81, of which $66,609.19 was for maintenance.

The operations during the year consisted of maintenance. Some shoaling has occurred in the protected area, which is now being dredged under an existing contract. Three clumps of piles, one at the end of the North Pier, and two at the end of the outer breakwater, which were destroyed by winter storms, were replaced. Minor repairs were made to the outer breakwater.

About 900 feet of the north pier are in a very dilapidated and rotten condition and must soon be rebuilt, as the structure has now exceeded by several years the customary life of such structures. When the rebuilding is done concrete construction should be used.

All original work of past and existing projects has now been completed, leaving since 1905 only its repair and other maintenance.

At present the protected harbor behind the lake breakwater is about one-half square mile in area, with 20 feet depth except the westerly portion, north of the harbor entrance, which has shoaled up to depths of 18 and 19 feet; and the pier entrance to the river is of 300 feet width, with at least 20 feet channel depth; all depths being referred to Chicago city datum. (See Chicago Harbor report.)

The maximum draft that can be carried at mean low water is 20 feet.

The water level has a total variation of about 6.5 feet from the highest known to lowest known water, and an average of less than 1 foot oscillation per day.

Calumet Harbor, being mainly a protection to Calumet River entrance, has practically no commerce except that of Calumet River, although about half of the Illinois Steel Co.'s commerce, belonging partly to the harbor and partly to the river and estimated herewith, as usual, under Calumet River, belongs strictly to the harbor. The harbor works are fully entitled to half the credit of all the commerce developed by the combined harbor and river improvements since 1870, such development having now reached about 7,000,000 short tons annually.

The existence of this improved harbor is considered to be of great use in controlling freight rates, and is claimed to save at least 50 cents per ton over Chicago River rates, and more over the usual Calumet (South Chicago) railroad rates.

It is proposed to apply the funds now available to the necessary repair and other maintenance of the works.

July 1, 1911, balance unexpended	$108, 202. 56
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	8, 858. 90
July 1, 1912, balance unexpended	99, 343. 66
July 1, 1912, amount covered by uncompleted contracts	32, 604. 41

(See Appendix K K 3.)

4. *Calumet River, Ill. and Ind.*—This river forms the inner harbor of Calumet Harbor. About 7.83 miles from Lake Michigan is the "Junction" or head of Main Calumet River where it divides into the Little Calumet and Grand Calumet rivers. The project depth of 21 feet extends up the main river to the "Forks" (entrance to Lake Calumet), a distance of 6.18 miles from its mouth. Grand Calumet River is a lagoon or bayou about 18 miles long and has no current except that caused by floods or variations in the water level of Lake Michigan and has an average depth of 5 feet to the entrance of Indiana Harbor Canal, distant about 5.17 miles from the "Junction." Little Calumet River is a very crooked stream about 60 miles long and has an average depth of about 8 feet to the site of an old stone dam at Blue Island, Ill., distant about 7.14 miles from the "Junction." All depths are referred to Chicago city datum. (See Chicago Harbor report.)

Before improvement of Calumet Harbor by the United States (1870), this river, while having a navigable channel of about 100 feet width and 13 feet depth for about 4 miles length, could not be reached from the lake by boats of over 4-foot draft, because of the bar across its mouth, and its commerce was then practically nothing. At the time of the improvement of the river itself (1884), the river had become navigable for 12-foot draft over widths of about 100 feet and a length of about 4 miles; and for boats of 5-foot draft over widths of about 50 feet and lengths from the river mouth of about 16 miles in the Grand Calumet and about 14 miles in the Little Calumet. The commerce at that time was, however, less than 500,000 tons. A good brief history of this river and harbor improvement prior to 1876 is given on pages 441–444, part 2, Annual Report of the Chief of Engineers for 1876, and a very full description of present conditions is to be found on pages 184–186, Bulletin No. 21 (1912), issued by the United States Lake Survey Office, Detroit, Mich.

For map of river see page 1902, Annual Report for 1903.

The project for the improvement of this river, adopted by Congress in 1884 and modified in 1886, contemplated securing a channel 200 feet in width and 16 feet in depth below low water in Lake Michigan from the mouth of Calumet Harbor, Ill., about 11 miles upward, to a point one-half mile east of Hammond, Ind. This project was modified by the river and harbor act of June 3, 1896, for Calumet Harbor, so as to provide for dredging the channel to 20 feet depth from the mouth 2 miles southward (upward).

The projects of 1884 to 1896, now ended, secured a permanent channel of 200 feet width and 20 feet draft from the mouth of the river about 2 miles upstream (including a small turning basin near the mouth of the river), thence 16 feet draft about 3 miles farther, except over short portions, where rock reduced the width to 85 feet and the depth to 14 feet; and, in addition a temporary channel of 10 feet depth and 60 feet width, in the next 6 miles, up to a point on the Grand Calumet one-half mile east of Hammond, Ind. (about 11 miles above the mouth).

There has been expended on previous projects $446,718.98, including $45,230.48 for maintenance.

The existing projects, adopted by act of March 3, 1905, provided for a channel 200 feet wide and 20 feet draft from the mouth of the river to One hundred and twenty-second Street, and of the same width and 16 feet draft from One hundred and twenty-second Street to the forks, with five turning basins, at a total estimated cost of $662,480.50, and $10,000 per annum for maintenance. (See p. 605, Annual Report of the Chief of Engineers for 1906.) The construction of the turning basins was made contingent upon the donation of the necessary land to the United States free of cost.

The river and harbor act of June 25, 1910, modified this project in accordance with report printed in House Document No. 172, Fifty-eighth Congress, second session, so as to permit the use of turning basins above number one of such shape and dimensions as will enable a vessel 650 feet in length to turn with ease; and that it shall be further modified so as to provide a navigable depth of 20 feet from One hundred and twenty-second Street to the forks of the river, and a turning basin at the forks having a similar depth and a water surface diameter of 750 feet, in accordance with report printed in House Document No. 349, Sixtieth Congress, first session; and that the amounts heretofore appropriated shall be available for such modified project.

For estimates, see pages 2942-2949, Annual Report of the Chief of Engineers for 1904; for map, see page 1902 of the report for 1903; also, for fuller details, see House Document No. 172, Fifty-eighth Congress, second session, and House Document No. 349, Sixtieth Congress, first session.

The total amount covered by these estimates, $820,500, has been appropriated and was believed to be sufficient for completing the entire project and allowing five years (1906–1910) of maintenance at $10,000 per year, one year (1911) of maintenance at $20,000, and one year (1912) at $10,000. An examination and survey made during the summer of 1911, however, indicated that the estimated cost of completing the project was too low, principally on account of the dimensions of turning basins Nos. 1 and 5 having been enlarged, and authority was obtained to increase the estimate by $95,000.

The act of June 13, 1902, authorized the Secretary of War to accept deeds, free of expense to the United States, for lands necessary to make a proper channel 200 feet wide from the forks up to a point one-half mile above Hammond, Ind. (a stretch of about 5.5 miles).

There has been expended on the present project (adopted in 1905) to June 30, 1912, $740,274.24, of which $21,639.62 was for maintenance.

The following work was accomplished during the year: Under continuing-contract authorization 232,878 cubic yards of material were dredged, of which 111,931 was maintenance. Surveys made last year were plotted and maps drawn.

The acts of June 13, 1903, and March 3, 1905, authorized the Secretary of War to accept deeds free of expense to the United States for the acquisition of lands for widening the river and for turning Basins Nos. 1 and 5. The land for turning Basins Nos. 1 and 5 has been acquired and the basins have been dredged.

Some deeds have been tendered for the lands necessary for widening the river between the "Forks" and the junction of the Little and Grand Calumet Rivers, a distance of about 1.65 miles. Although Congress has authorized the Secretary of War to accept such deeds for lands above the Forks, no appropriation has been made for doing the work.

The right of the Sanitary District of Chicago to reverse the flow of Calumet River is still pending in the United States circuit court at Chicago.

A permit for this work was given by the Secretary of War June 30, 1910, upon certain-named conditions, one of which being that the total flow of water through the Calumet and Chicago Rivers shall not exceed the present permitted flow through the Chicago River (250,000 cubic feet per minute); another that the above-mentioned suit shall in no wise be affected by the issuance of the permit.

Expenditures up to date have resulted in a channel 21 feet depth (Chicago datum), from the river mouth to the "Forks," including turning Basin No. 5, except at the sites of the Calumet Western and Western Indiana Railroad bridges and that of the Torrence Avenue pontoon bridge; thence about 5 feet depth, with about 50 feet width (dredged prior to 1895 to 10 feet depth and to 60 feet width, but since partly filled up) to Hammond, Ind.

The maximum draft that can be carried at mean low water is as indicated above, and the river is farther navigable for 6-foot draft boats to Riverdale on the Little Calumet, 12 miles from the river mouth. It can also be used by light-draft launches, such as can pass under bridges, nearly to Gary on the Grand Calumet, about 20 miles from the river mouth, and to Blue Island on the Little Calumet, about 14 miles from the river mouth, being stopped at that point by rapids.

The water level has variations of about 6.5 feet from highest known to lowest known water, and an average of less than 1 foot per day. At dead low water the river is practically level from the lake up to the junction of the Grand and Little Calumet. The current is very slight except during freshet and lake seiches.

The annual commerce has reached about 7,000,000 short tons, the principal items being iron ore, grain, and coal. New manufacturing plants are steadily occupying the river banks as fast as the 20-foot depths are carried upstream.

The existence of this improved river is considered to be of great use in controlling freight rates and is claimed to save at least 50 cents per ton over Chicago River rates and more over the usual Calumet (South Chicago) railroad rates.

It is proposed to apply the funds now available and those asked for to completing the 1903 project, adopted by act of March 3, 1905, as modified by act of June 25, 1910, and to maintenance.

Under appropriation of August 18, 1894, for "above the forks," $1,908.45 is still available, but dredging has been discontinued because of constant refilling.

A statement of past examination and survey reports will be found on page 605, Annual Report, 1906, and reference to report on examination made in compliance with act of March 2, 1907, will be found on page 681, Annual Report, 1908.

July 1, 1911, balance unexpended		$154,486.94
Received from sale of maps		2.46
		154,489.40
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$47,621.56	
For maintenance of improvement	21,639.62	
		69,261.18
July 1, 1912, balance unexpended		85,228.22
Amount (estimated) required to be appropriated for completion of existing project		[1]95,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1]20,000.00

(See Appendix K K 4.)

5. Indiana Harbor, Ind.—This harbor is 6.5 miles southeast of Calumet Harbor, Ill., and was built by private enterprise by constructing parallel piers 300 feet apart projecting into Lake Michigan and by dredging a channel 21 feet deep between them. The northerly pier extends into the lake in a northeasterly direction 550 feet from the shore line of 1901, thence at an angle of 22° 30′ eastward 610 feet, thence at a similar angle eastward 575 feet, where it ends in 20 feet depth of water. The southerly pier runs parallel with the other for a distance of 1,055 feet, where a pier arm extends 200 feet in a northerly direction, thereby contracting the harbor entrance to about 100 feet. Both piers extend landward from the shore line of 1901 about 500 feet, where the channel is contracted to 65 feet width, the clear width of span of five railroad bridges at that point. There is also an inner harbor 200 feet wide which extends from these railroad crossings 1½ miles in a southwesterly direction, thence 2 miles due south to a point on the Grand Calumet River. From the bend in this channel there is proposed a branch canal 1½ miles long to connect with Lake George. At a point about 1.1 miles from the lake is a turning basin about 400 feet square.

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[1] Exclusive of the balance unexpended July 1, 1912.

The project for this improvement was adopted by Congress in the river and harbor act of June 25, 1910, and provides for an outer harbor about 300 feet wide and 22 feet deep (Chicago City datum), and an inner harbor or canal designed ultimately to extend to the Calumet River on the south, with a branch canal to Lake George on the west. The cost of this work was originally estimated at $62,000, with $5,000 annually for maintenance for the first three years after completion. The United States has assumed the maintenance of the outer harbor and has done the necessary dredging to provide an adequate channel of approach to and between the piers. It is proposed to take over the inner channel or waterway and assume its maintenance as fast as private interests shall complete the channelway and equip it with suitable bridge draws. The full project is reported in House Document 1113, Sixtieth Congress, second session. A very full description of present conditions is to be found on pages 186 to 188, Bulletin No. 21 (1912), issued by United States Lake Survey Office.

Title to the right of way, including a turning basin, became vested in the United States October 28, 1910, and December 29, 1910, respectively.

For this work $62,000 was appropriated by the river and harbor act of June 25, 1910, and the general deficiency act approved March 4, 1911, contained a provision making available so much as may be necessary of the unexpended balance of the appropriations heretofore made for this harbor as, in the discretion of the Secretary of War, may be necessary for maintenance of the inner harbor, in accordance with the provisions of House Document No. 1113, Sixtieth Congress, second session.

When the estimate and project for the improvement of this harbor were made, the Lake Survey Office was engaged in making an extensive survey of the southern end of Lake Michigan, including this locality, the result of which disclosed good reasons for change in direction of the entrance channel and necessitated a channel of much greater length and width than had been anticipated. This survey further indicated a number of bars at the approach to the harbor. The lengthening and widening of the channel, together with cutting through the bars will, it is estimated, increase the amount to be dredged by 139,600 cubic yards, which at 25 cents per cubic yard, the present contract price for dredging in the lake, equals $34,900 or, in round figures, $35,000. The estimate was increased and this amount included in report for 1911.

There has been expended on the present project to June 30, 1912, the sum of $60,667.41.

Operations were in progress during the year under a contract for dredging the channel in accordance with the approved project, under which a beginning was made last year, and resulted in the removal of 234,363 cubic yards of material. The Light-House Department placed the necessary aids to navigation marking the entrance channel.

The maximum draft that can be carried over the shoalest part of this locality is 22 feet.

As the area outside of the present harbor is not protected by a breakwater, the dredged channel is liable to shoal very materially.

The question of appointing a deputy surveyor of customs to gather commercial statistics is understood to have been under consideration, but such appointment has not yet been made and no data as to such statistics are available. Information from industries located on this waterway indicates that a large water tonnage will develop upon completion of the proposed improvement, which will probably decrease freight rates.

By the act approved February 27, 1911, Congress ordered a preliminary examination to be made at this harbor, with a view to the construction of a breakwater to protect the entrance of the harbor. This report is printed as House Document No. 690, Sixty-second Congress, second session.

It is proposed to apply the available funds and those asked for to complete the improvement and for maintenance of this channel.

Examination reports on this harbor were made December 8, 1905 (printed as H. Doc. No. 721, 59th Cong., 1st sess.), and November 14, 1907 (printed as H. Doc. No. 1113, 60th Cong., 2d sess.).

July 1, 1911, balance unexpended	$60, 594. 41
June 30, 1912, amount expended during fiscal year, for works of improvement	59, 261. 82
July 1, 1912, balance unexpended	1, 332. 59
Amount appropriated by river and harbor act approved July 25, 1912	25, 000. 00
Amount available for fiscal year ending June 30, 1913	26, 332. 59
Amount (estimated) required to be appropriated for completion of existing project	[1] 15, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 25, 000. 00

(See Appendix K K 5.)

6. *Michigan City Harbor, Ind.*—This harbor is about 32 miles east of Calumet Harbor, or South Chicago, and about 38 miles in a southeasterly direction from the mouth of the Chicago River.

The approved project provides that dredging be done in such a was as to maintain a channel depth of 15 feet below Chicago city datum (low water of 1847), which is 579.94 feet above New York mean tide. The early improvements at this harbor were referred to zero of Michigan City Harbor gauge, which is 581.64 feet above New York mean tide, or 3.12 feet above standard low water of Lake Survey charts. The present project depth is not sufficient for the steamboats which now carry on traffic at this harbor; the channel depth should be at least 18 feet to accommodate these boats.

The annual commerce is now reported as 27,063 short tons and consists principally of lumber and salt. The local commerce, consisting principally of package freight between Michigan City and Chicago, is steadily increasing, but no accurate record of this tonnage is kept. The passenger travel (summer excursion) is increasing rapidly.

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[1] Exclusive of amount available for fiscal year 1913.

Information received as to the effect of the project on freight rates is meager, but indicates that in a general way the improvement has a tendency to reduce charges and secure advantageous charters for shippers.

Before improvement by the United States the depths over the bar outside the entrance were about 9 feet and at the entrance 3½ feet or less; the widths varied from 175 feet in the lower portion to 60 feet or less in the upper portion.

The improvement was commenced in 1836 and was limited to confining the channel at the outlet by piers placed 100 feet apart and running directly into the lake. These piers were extended from time to time, and the channel deepened by dredging. In 1870 the project was enlarged by the adoption of a plan for creating an outer harbor by constructing breakwaters and dredging the basin formed thereby to a depth of 14 feet, and in 1882 by the construction of an exterior breakwater northwest of the entrance. The project of 1870 was amended in 1880, 1882, and 1899.

A brief history of this improvement is given on pages 678–680, Annual Report of the Chief of Engineers for 1908 (see also pp. 447–451, Annual Report of the Chief of Engineers for 1876), and a very full description of present conditions is to be found on pages 189–193, Bulletin No. 21 (1912), issued by the United States Lake Survey office, Detroit, Mich.

There has been expended on the work prior to operations under the existing project of 1908, $1,568,799.26, including $249,670.49 for maintenance.

By joint resolution of Congress approved May 13, 1908 (Public, No. 23), the Secretary of War was authorized, in his discretion, to use any unexpended balance of money heretofore appropriated, or that may be hereafter appropriated, for the improvement or maintenance of this harbor, for the rebuilding of the western revetment upon a new alignment, with the view of widening the channel.

In accordance with this authorization, a new general project was approved by the War Department under date of August 15, 1908, and covers the following items of work:

Widening of inner harbor entrance (building of new pier, removal of old pier, and dredging between)	$72,000
Redredging of inner harbor channel	50,000
Original dredging, upper end of inner harbor	16,000
Completion of exterior breakwater	30,000
Repair, maintenance, and supervision	12,000
Total	180,000

in such way as to secure and maintain a channel depth of 15 feet below Lake Survey standard low water, with widths and lengths in the inner harbor of from 120 to 150 feet between docks where established by the city, and from the Lake Erie & Western Railroad bridge downstream to Lake Michigan, about 10,459 feet, including an upper and a middle turning basin; and with about 225 feet width between lake piers; and to provide and maintain the necessary piers and breakwaters.

The river and harbor act of June 25, 1910, authorized the repair and maintenance of the old abandoned pier and breakwater structures inclosing the basin north and east of the outer harbor, which is not included in the present approved estimates.

These structures are in a very bad condition, especially in some places where the outer wall is entirely broken up, permitting the stone filling to run out. Proper maintenance of these structures would require entire rebuilding, and the available funds for this improvement are not sufficient for such work.

There has been expended on the present project, adopted in 1908, $185,917.91, of which $104,003.05 was for maintenance.

The work done during the year was entirely maintenance, and consisted of the following:

Fifty feet of the concrete superstructure over the outer 100 feet of the end of the outer breakwater was constructed, thus completing contract for this work; 85,136 cubic yards of material were removed from the channel from Franklin Street Bridge to deep water in the harbor entrance; about 200 feet of new superstructure over the east breakwater pier was practically completed, and the pile pier at the angle between the easterly harbor pier and old east breakwater was constructed.

Expenditures up to date have resulted in the widening and deepening of the inner harbor by erecting piers and dredging between them until it has now a width ranging from over 200 feet at its lake end to 100 feet at its river end and a depth of about 18 feet to Franklin Street Bridge; in extending the channel up Trail Creek a distance of nearly 2 miles from the harbor entrance; providing a width of from 120 to 150 feet and depth of 14 feet to a point about a mile above Franklin Street Bridge and 4 feet to the upper turning basin; in the construction of three turning basins; in the formation of a basin east of the entrance to the harbor; and the erection of an exterior breakwater to protect the harbor entrance.

The head of navigation is at the upper turning basin, a distance of about 2 miles from the end of the westerly pier.

The funds in hand and those asked for will be expended toward the completion of the approved project and for maintenance and contingencies.

July 1, 1911, balance unexpended	$96,595.92
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	32,849.32
July 1, 1912, balance unexpended	63,746.60
Amount appropriated by river and harbor act approved July 25, 1912	10,000.00
Amount available for fiscal year ending June 30, 1913	73,746.60
July 1, 1912, amount covered by uncompleted contracts	25,190.77
Amount (estimated) required to be appropriated for completion of existing project	[1] 39,500.00
Amount that can be profitably be expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 35,000.00

(See Appendix K K 6.)

7. *Illinois River, Ill.*—The Illinois River is formed by the conjunction of the Kankakee and Des Plaines Rivers at a point in Grundy County, Ill., about 50 miles above La Salle, flowing in a southwesterly direction and emptying into the Mississippi River at Grafton, Ill.,

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[1] Exclusive of amount available for fiscal year 1913.

about 36 miles above St. Louis, Mo. The total length of the stream is 273 miles.

That portion of the river under improvement by the United States, from La Salle to the mouth at Grafton, Ill., 223 miles in length, is divided into two sections, viz: (*a*) "Below Copperas Creek" (general improvement), 137 miles, and (*b*) "From Copperas Creek to La Salle," 86 miles.

No appropriation has been made for nor work of improvement undertaken by the United States on the section of the river above La Salle, Ill., the present head of navigation for steamers. Such steamers could also reach the State park at Starved Rock, about 5 miles above La Salle, were it not for the existence of the Chicago, Burlington & Quincy Railroad bridge at La Salle, which is a fixed bridge of insufficient headroom for the passage of these boats. On complaint of the rivers and lakes commission of Illinois that this bridge is a serious obstruction to navigation a public hearing was held on June 4, 1912, resulting in a recommendation that the Chicago, Burlington & Quincy Railroad Co. be required to make certain alterations in said bridge, including a suitable draw span. From Starved Rock to Marseilles, a distance of about 19 miles, a draft of about 3 feet can be carried, but navigation at this point is stopped by a fixed dam across the river. Such navigation as passes between Chicago and the Mississippi River is through the Illinois & Michigan Canal from Joliet, Ill. (the terminus of the Chicago Sanitary & Ship Canal), to the Illinois River at La Salle, as described on page 179, Bulletin No. 21 (1912), issued by the United States Lake Survey Office, Detroit, Mich.

Improvement work is referred to Memphis datum, which is 587.04 feet below Chicago city datum, or 7.1 feet below New York mean tide.

On June 30, 1912, a minimum depth of 6 feet at mean low water was available throughout the length of the river under improvement; that is, from the mouth to La Salle. The available width is from 160 to 200 feet. The fluctuations in stage from low water to flood stage is upward of 15 feet.

(*a*) *Below Copperas Creek.*—The project, which contemplates the extension of slack-water improvement begun by the State of Illinois from Copperas Creek Lock to the Mississippi River, and which includes the construction of two locks 350 feet long between sills, 75 feet width of chamber, with 7 feet of water over sills at low-water level of 1879, and dredging the channel where necessary to obtain 7 feet depth at low water, was adopted in 1880.

The lock and dam at Kampsville, Ill., 31 miles above the mouth of Illinois River, has been completed and in use since 1894, and that at La Grange, 79 miles above the mouth, since 1890.

The State of Illinois, aided by the United States, has executed part of the general project by the construction of locks and dams at Henry and at Copperas Creek, completing, except dredging, that part of the project between La Salle and the mouth of Copperas Creek, a distance of about 86 miles, over which section the State of Illinois collects tolls.

Harbor lines on both sides of the river at Peoria have been established.

The United States has expended on this work to June 30, 1912, $1,571,249.15, of which $15,897.70 was expended during the fiscal year in dredging at miles 7, 8, 31, 160, and 162, maintenance of plant, supervision of river, and care of property and plant.

The improvement of Illinois River has been in progress many years, and the present navigable depth has obtained at ordinary stages of the river for several years, during which freight rates in the vicinity have decreased to some extent; but as freight rates generally have diminished during these years, it is impossible to state whether the effect of river competition is shown in diminished railroad freight rates. The closing of the river to navigation, however, would unquestionably lead to a rise in freight rates on the adjacent railways, and as the volume of freight affected would be large, a good navigable condition should be maintained.

There are many wagon bridges and railroad bridges across the river, and at Peoria the troughs of large distilleries discharge into the channel; these structures have been modified from time to time to meet the demands of navigation.

It is proposed to apply the available funds and those estimated for in maintaining the navigable channel of 7 feet depth, removing snags, care and repair of property and plant, and in making such local surveys as may from time to time be necessary, and the construction of a new dredge.

By the act approved June 25, 1910, Congress ordered a preliminary examination to be made between Hurricane Island and Calhoun County, for the purpose of providing a suitable channel. The report on this examination was submitted by the district officer and is now having consideration by the Board of Engineers for Rivers and Harbors, and it is expected that the report will be transmitted to Congress during its next session.

July 1, 1911, balance unexpended	$61,599.21
Received from transfer of property	2,000.00
	63,599.21
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	15,897.70
July 1, 1912, balance unexpended	47,701.51
July 1, 1912, outstanding liabilities	673.63
July 1, 1912, balance available	47,027.88
Amount appropriated by river and harbor act approved July 25, 1912	20,000.00
Amount available for fiscal year ending June 30, 1913	67,027.88
Amount (estimated) required to be appropriated for completion of existing project	[1] 92,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 100,000.00

(*b*) *From Copperas Creek to La Salle.*—The first appropriation for this section of the river was made March 2, 1907, and the approved project for its expenditure provides for securing the same navigable conditions from Copperas Creek to La Salle as are planned for the lower river, i. e., a channel depth of 7 feet at low water.

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[1] Exclusive of amount available for fiscal year 1913.

Operations have consisted in snagging, supervision, dredging, and repairs and additions to plant, and surveys to locate shoal points and bars. Work on this section of the river is carried on with the same plant used on the lower section, with headquarters at Peoria, Ill.

The dredging of a channel in Lake Depue and entrance thereto was completed during the year.

The amount expended on this work to June 30, 1912, is $39,974.27, of which $6,633.09 was expended during the fiscal year.

It is proposed to apply the available funds to securing and maintaining a navigable channel of 7 feet depth, snagging, care and repair of property and plant, inspection and prevention of obstructions and encroachments, and such local surveys as may be necessary.

July 1, 1911, balance unexpended	$16,658.82
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	6,633.09
July 1, 1912, balance unexpended	10,025.73
July 1, 1912, outstanding liabilities	290.98
July 1, 1912, balance available	9,734.75

(See Appendix K K 7.)

8. *Operating and care of La Grange and Kampsville Locks, Illinois River, and approaches thereto.*—These locks and dams have been maintained and operated under the indefinite appropriation provided for in section 4 of the river and harbor act of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909.

(*a*) *La Grange Lock and Dam.*—The lock was closed to navigation by ice from January 10, to March 18, 1912. Between October 1, 1911, and June 15, 1912, 80 per cent of the boats passed over the dam. All boats passed through the lock during the rest of the year. There was expended during the fiscal year $6,188.09.

Statement showing cost of operating and maintaining La Grange Lock and Dam, Illinois River, since its opening on Oct. 21, 1889.

Fiscal year—		Fiscal year—	
1890	$7,176.96	1902	$6.294.84
1891	9,275.03	1903	5,902.65
1892	8,004.06	1904	5,849.90
1893	4,709.11	1905	5,463.68
1894	10,234 64	1906	6,370.16
1895	5,786.73	1907	6,588.27
1896	5,124.83	1908	5.936.48
1897	9,802.33	1909	6.892.17
1898	6,344.37	1910	7,473.66
1899	6,331.15	1911	6,250.35
1900	5,692.07	1912	6,188.09
1901	4,316.74		

(*b*) *Kampsville Lock and Dam.*—The lock was closed to navigation from December 31, 1911, to March 13, 1912. All boats passed over the dam from September 26, 1911, to June 21, 1912, and through the lock during the rest of the year. The expenditures during the fiscal year were $5,208.63.

Statement showing cost of operating and maintaining Kampsville Lock and Dam, Illinois River, since its opening, Sept. 30 1893.

Fiscal year—	
1894	$4,266.09
1895	8,201.96
1896	9,257.20
1897	10,205.41
1898	7,223.31
1899	7,048.85
1900	6,533.08
1901	5,338.23
1902	5,785.21
1903	5,508.81
1904	$5,127.04
1905	5,773.63
1906	6,963.61
1907	6,471.86
1908	7,378.08
1909	6,652.42
1910	7,366.55
1911	5,510.92
1912	5,208.63

(See Appendix K K 8.)

EXAMINATION AND SURVEY MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

Reports dated August 28, 1909, and October 7, 1911, with map, on preliminary examination and survey, respectively, of *harbors and rivers at or near Chicago, Ill., including Chicago Harbor, Chicago River, Calumet Harbor, Grand Calumet and Little Calumet Rivers, Ill. and Ind., Lake Calumet, and necessary connection with Calumet River, and the lake shore from the mouth of Chicago River to the city of Gary, Ind.*, for the purpose of reporting a plan for a complete, systematic, and broad improvement of harbor facilities for Chicago and adjacent territory, required by the river and harbor act approved March 3, 1909, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 710, Sixty-second Congress, second session. A plan for the partial improvement of the locality, as described in the reports, at an estimated cost of $1,211,195, is presented.

EXAMINATION AND SURVEY MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Reports dated July 25, 1911, and January 25, 1912, with maps, on preliminary examination and survey, respectively, of *Indiana Harbor, Ind., with a view to the construction of a breakwater to protect the entrance of the harbor*, required by the river and harbor act approved February 27, 1911, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 690, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $1,033,200 for first construction, and the construction of shore connections for both breakwaters, at a total additional first cost of $310,000, subject to certain specified conditions, is presented.

EXAMINATION AND SURVEY REQUIRED BY RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

The local officer was also charged with the duty of making a preliminary examination and survey required by the river and harbor act approved June 25, 1910, as follows, and it is expected that reports thereon will be ready for transmission to Congress during its next session.

1. West Branch, South fork, Chicago River, Ill., from Robey Street west to Forty-eighth Avenue, with a view to securing a channel 21 feet deep and 175 feet wide, except through rock cutting it shall be 100 feet wide.

2. Illinois River, Ill., between Hurricane Island and Calhoun County, for the purpose of providing a suitable channel.

IMPROVEMENT OF RIVERS AND HARBORS IN THE GRAND RAPIDS, MICH., DISTRICT.

This district was in the charge of Lieut. Col. C. S. Riché, Corps of Engineers. Division engineer, Col. C. McD. Townsend, Corps of Engineers.

General statement as to the usual variations in the level of the lake surface at all the harbors on the eastern shore of Lake Michigan.—The level of the lake surface varies considerably from time to time. At present its highest stage may be stated as about 1 foot below the mean lake level, and obtains from the end of June to the middle of August. Its lowest stage is from 1½ to 2 feet below mean lake level, and obtains with slight change from early in November to April. The depth at the various harbors in this report are referred to zero of gauge, which is 581.63 feet above mean tide at New York, and is the mean lake level above mentioned, except the project depths, which are actual depths of water unless otherwise stated.

1. St. Joseph Harbor and River, Mich.—These were formerly carried as separate works, but are now combined in consequence of a provision in the river and harbor act of June 13, 1902.

(*a*) *St. Joseph Harbor.*—This harbor is formed by the junction of the St. Joseph and Paw Paw Rivers and extends along the city front of St. Joseph, and in its original condition had a natural width of 800 feet, which has been reduced to 300 feet by wharves built upon the approved harbor lines. Michigan City, the nearest harbor to the south, is distant about 35 miles by water, and South Haven, the nearest harbor to the northeast, is distant about 23 miles; Chicago is distant about 60 miles. It has been under improvement by the United States since 1836, previous to which time there was a narrow and crooked channel with depths which varied from 3 to 7 feet. The original project of 1836 is not clearly known. Up to 1866 there were built 1,100 feet of north pier and 212 feet of south pier, which protected a cut through the narrow tongue of land to the north of the old river mouth, the width between the piers being 240 feet, which became 257 feet through subsequent repairs. In all, $162,113 was expended upon this work. In 1866 the first definitely known project was adopted, and this proposed the extension of the south pier 200 feet for the purpose of facilitating the creation of a direct channel of 16 feet depth through the bar at the entrance. The project of 1866 was modified in 1874, 1875, 1880, and 1892, the changes having reference principally to the length and direction of the two piers. The Benton Harbor Canal, which is about 1 mile long and extends from the upper part of the harbor to the town of Benton Harbor, was taken over by the United States for the purpose of care, maintenance, and improvement in 1880. In all, there was expended upon these various projects $503,113.23.

The river and harbor act of March 3, 1899, adopted the present project, which is printed in the Annual Report of the Chief of Engineers for 1898, pages 2496–2498, and in House Document No. 307, Fifty-fifth Congress, second session. This project, which has not been modified, provides for an entrance channel 18 feet deep and for an interior channel 18 feet deep and 150 feet wide along the city front of St. Joseph, while the Benton Harbor Canal and the turning basin at the mouth of the St. Joseph River were to be dredged to 15 feet, the north pier extended 1,000 feet, and the south pier, upon a line parallel with the north pier, 1,800 feet. The width was to be 330 feet at the entrance, narrowing to 257 feet inside. The estimated cost of completion of the existing project was given in the above report at $380,000.

House Document No. 307, Fifty-fifth Congress, second session, reproduces a map accompanying the present revised project; this map is not republished in the Annual Report of the Chief of Engineers for 1898. In House Document No. 629, Sixty-second Congress, second session, is a preliminary examination report which contains a map of the harbor as far east as the mouth of the Paw Paw River.

The operations for the fiscal year were all for maintenance, as follows: Permanent repairs to the outer end of the south pier damaged by the steamer *City of Chicago*, September 3, 1910, were completed. Repairs were made to the outer 30 feet of the lake side wall at the outer end of the north pier where a portion of the wall had been carried away. The emergency contract for riprap and stone filling for the outer portion of the piers, begun the previous year, was completed with the placing of 1,954 tons of riprap and 103 tons of stone filling. Miscellaneous repairs by day labor were made as needed to decayed cross walls, plank walk, and deck in both piers and revetments. To complete the filling in the exposed portions of the piers, 202.5 tons of stone were purchased and placed in the outer ends of the two piers. Navigable depth in the Benton Harbor Canal, at the mouth of the Paw Paw River, was restored by contract dredging in April-June, 1912; a total of 16,512 cubic yards were removed.

Up to June 30, 1912, there has been expended upon the existing project $398,516.68, of which $95,423.30 was applied to maintenance.

All new construction work and dredging to the proposed depth and width under the approved project have been completed, and present operations are confined to maintenance.

The north pier and revetments measure 2,854 feet, 2,183.5 feet being cribwork and 670.5 feet pilework; at the east end a wing 165 feet long connects it with the dock of the United States lighthouse depot. The south pier is 2,603 feet long, 1,780 feet being cribwork and 820 feet pilework. These structures are in fair condition, except the 165 feet of wing at east end of north pier and the superstructure over the inner portions of the pilework, which is becoming decayed.

The completion of the approved project has resulted in a through channel of largely increased width, depth, and general availability. The channel is, however, subject to deterioration due to sand brought down by the St. Joseph and Paw Paw Rivers during the annual floods, and has required and will continue to require repeated dredging for its maintenance. The available depths on June 30, 1912, were as follows: In the outer approach, not known; between the piers, 18 feet; in interior harbor from the inner end of the piers to mouth of Benton Harbor Canal, 16 feet; and in Benton Harbor Canal, 16 feet.

The lake commerce during 1911 amounted to 183,163 short tons, valued at $14,403,248, of which about 70 per cent was local and 30 per cent through traffic. The total number of passengers carried was 281,842, and the number of vessel arrivals and departures was 1,316.

The principal traffic benefited by this improvement is the transportation of manufactured products, the fruit traffic, and the carrying of passengers, including excursionists. One line of steamers, during the summer, runs from two to four boats daily, and another line makes daily trips across the lake. The vessel freight rates to Chicago are about 14 per cent less than the corresponding railroad rates.

The balance on hand is about $1,200. This, together with the $15,000 appropriated by the river and harbor act approved July 25, 1912, will be expended during the fiscal year ending June 30, 1913, for maintenance by dredging, general repairs, and contingencies. It is recommended that $5,000 be appropriated for the fiscal year ending June 30, 1914, for maintenance by dredging, for general repairs, and for contingencies.

(*b*) *St. Joseph River.*—This is a crooked stream, obstructed by numerous shoals, with depth in channel crossings of from 24 to 30 inches. The intervening pools are generally from 4 to 8 feet deep. The part under improvement has been from the mouth at St. Joseph to Berrien Springs, a distance of about 22 miles by river. The improvement of this section to make a low-water channel 3 feet deep has been in progress since 1889, and consists in removing snags and logs and closing secondary channels, and in concentrating the flow at critical points by dams of brush, logs, and stone.

The amount expended to June 30, 1912, was $6,985.88, of which $4,555.49 was for construction and $2,430.39 for maintenance, as a result of which many of the worst places of the stream had been improved in a temporary way from year to year. The amount of work done in recent years has been small.

During the fiscal year a temporary dam was built about mile 3 (above the mouth of the river) to close a secondary channel, and a wing dam was built about mile 6 to concentrate the flow; some snags and leaning trees were also removed.

The traffic benefited is becoming smaller year by year, and during recent low-water seasons has been confined mostly to the lower 6 miles of the river. The boats using the river are shallow-draft gasoline launches carrying resort passengers. No freight was carried in 1911 and no statement has been received of the number of passengers carried.

The balance on hand is about $280, and the river and harbor act of July 25, 1912, contains an appropriation of $500 for maintenance. For the fiscal year ending June 30, 1914, the sum of $1,000 is recommended to be appropriated for general maintenance of the channel.

ST. JOSEPH HARBOR.

July 1, 1911, balance unexpended	$18,402.26
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	15,586.64
July 1, 1912, balance unexpended	2,815.62
July 1, 1912, outstanding liabilities	1,385.52
July 1, 1912, balance available	1,430.10
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	15,000.00
Amount available for fiscal year ending June 30, 1913	16,430.10
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

ST. JOSEPH RIVER.

July 1, 1911, balance unexpended	$986.67
Miscellaneous receipts	22.72
	1,009.39
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	722.55
July 1, 1912, balance unexpended	286.84
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	500.00
Amount available for fiscal year ending June 30, 1913	786.84
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	(1)

CONSOLIDATED.

July 1, 1911, balance unexpended	$19,388.93
Miscellaneous receipts	22.72
	19,411.65
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	16,309.19
July 1, 1912, balance unexpended	3,102.46
July 1, 1912, outstanding liabilities	1,385.52
July 1, 1912, balance available	1,716.94
Amount appropriated by river and harbor act approved July 25, 1912	15,500.00
Amount available for fiscal year ending June 30, 1913	17,216.94
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2]6,000.00

(See Appendix L L 1.)

2. South Haven Harbor, Mich.—This harbor is situated at the mouth of Black River, about 23 miles by water from St. Joseph Harbor on the south and 19 miles from Saugatuck Harbor on the north. Improvements were begun in 1867, at which time there ex-

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[1] See consolidated money statement on this page.
[2] Exclusive of amount available for fiscal year 1913.

isted a channel 7 feet deep and 85 feet wide between slab piers. These piers had been built by residents of the vicinity, at a cost of about $18,000. The banks of the river for 500 feet on each side had a rough protection of close piling.

The project of 1866, as modified in 1869, 1872, and 1888, provided for constructing parallel piers and revetments 175 feet apart at the mouth of Black River, with the object of procuring a channel 12 feet deep and extending the navigable channel one-half mile up Black River to the highway bridge by dredging.

The act approved March 3, 1905, adopted a project for pier extension and dredging a channel 16 feet deep and 120 feet wide between the piers, and 90 feet wide above them, at an estimated cost of $279,370, and $10,000 annually for maintenance.

The Annual Report of the Chief of Engineers for 1904, pages 3056–3069, and House Document No. 119, Fifty-eighth Congress, second session, contain in full the reports on preliminary examination and survey relating to the existing project. A map of the harbor is attached to the House document.

The existing project provides for establishment of dock lines and building of bulkheads along such lines by local interests; for an available depth of channel of 16 feet at all stages; for repairs to present piers so as to permit the deeper dredging; for extension of each pier 800 feet, a total of 1,600 feet of pierwork; and for maintenance by dredging and by repair of existing structures.

The following work was done during the fiscal year: For new work: The contract dredging in the river from the inner end of the piers to the bridge to a depth of 18 feet below zero of gauge was completed July 8, 1911. The repairs to piers by contract were begun July 1 and completed November 16; these repairs covered the north pier and revetment from station 0+50 W to 13+38 W and the south pier station 8+52 W to 13+52 W. A contract was entered into April 26, 1912, for dredging between the entrance piers to a depth of 20 feet below zero of gauge and a width of about 115 feet; work was begun May 11 and completed June 15, completing the project dredging between the piers.

A contract was entered into April 26, 1912, for 400 feet extension to each pier. Work was begun June 6, and at the end of the month two cribs were built 13 courses and 4 courses high, respectively, the sites were dredged for six cribs, and 52 foundation piles were driven for the first crib.

For maintenance: Dredging by the *Meade*, April 26 to May 11, 1912, gave a resulting depth of 20 feet below zero of gauge on the entrance bar in Lake Michigan. Under oral agreement with the contractor for dredging between the piers, the channel in the river between station 10+80 E and the bridge was dredged to a depth of 18 feet below zero of gauge, June 16–27, 1912; this material was too soft to be handled by the *Meade*.

In October and November, 1911, repairs were made by day labor to decking and walk on both piers. Repairs were also made to damaged portions of superstructure, and to the walk, south pier station 0+00 to 8+00; the cost of these repairs was reimbursed by a bonding company for Mr. George B. Hannahs, who had used this portion of the south pier under a permit from the Secretary of War. Repairs were made in November, 1911, to the channel face of the south pier at the outer end damaged by a colliding vessel.

The total expenditure to June 30, 1912, was $427,942.73, of which $240,287.06 was expended for construction and $187,655.67 for maintenance.

The contract for pier extension, referred to above, was entered into under the continuing contract authorization of the river and harbor act of February 27, 1911 (see Annual Report, 1911, p. 860). The amount available for this work is $20,000. The sundry civil act of August 24, 1912, appropriated $40,000, and it is expected that the balance will be appropriated for in the next sundry civil bill about March, 1913. The continuing contract authorization is $198,000, of which $158,000 is yet to be appropriated.

To June 30, 1912, the approved project has been completed with the exception of the last two items named above, viz, the pier extension and the maintenance by dredging and maintenance of existing structures. The available depths below zero of gauge June 30, 1912, were 20 feet on the entrance bar in Lake Michigan and in the channel between the piers, and 18 feet in the river.

The water-borne commerce at this port is about 73 per cent local and 27 per cent through traffic. In 1911 there were 538 vessel arrivals and departures, with 19,244 short tons of cargo, with an estimated value of $1,269,423. The total number of passengers carried in 1911 was 150,326. Vessel freight rates to and from Chicago are 27 per cent less than the corresponding railroad rates.

The balance available from previous appropriations after reserving $20,000 for payments under the contract for pier extension is about $6,900, and this, together with $3,000 in the river and harbor act of July 25, 1912, will be used as may be needed during the fiscal year ending June 30, 1913, for maintenance of the channel, for repairs to piers, and for contingencies. For the fiscal year ending June 30, 1914, it is recommended that $3,000 be appropriated for maintenance.

The present contract for pier extension was entered into under the continuing contract authorization of the river and harbor act of February 27, 1911. The amount available for this work is $60,000, including the $40,000 appropriated by the sundry civil act of August 24, 1912, and it is expected that the balance for this contract, $43,000, will be provided for in the next following sundry civil bill about March, 1913, as the time allowed for this contract expires June 6, 1914. As the contract was let subject to these conditions as to funds, it is recommended that appropriations be made in accordance with the above plan.

July 1, 1911, balance unexpended		$85,746.14
Miscellaneous receipts		119.04
		85,865.18
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$50,017.13	
For maintenance of improvement	4,234.27	
		54,251.40
July 1, 1912, balance unexpended		31,613.78
July 1, 1912, outstanding liabilities		1,836.00
July 1, 1912, balance available		29,777.78

Amount appropriated by sundry civil act approved Aug. 24, 1912	$40,000.00
Amount appropriated by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	72,777.78
July 1, 1912, amount covered by uncompleted contracts	22,793.23
Amount of continuing contract authorization, act of Feb. 27, 1911	198,000.00
Amount appropriated under such authorization	40,000.00
existing project	[1]158,000.00
Amount (estimated) required to be appropriated for completion of existing projects [1]	158,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	43,000.00
For maintenance of improvement	3,000.00
Total	[1]46,000.00

(See Appendix L L 2.)

3. Harbor at Saugatuck and Kalamazoo River, Mich.—The harbor is about 19 miles by water from South Haven Harbor on the south and about 7 miles from Holland Harbor on the north. Before the work of improvement was begun by the United States, in 1869, this harbor, which is at the mouth of Kalamazoo River, had been improve by local enterprise by the construction of slab piers 200 feet apart, the north pier being 500 feet long and the south pier 1,575 feet. The channel depth varied from 5 to 7 feet. The project for the old harbor at the mouth of the river was adopted in 1867 and amended in 1869, 1875, and 1882. At the old harbor there is a north pier 715 feet long, which is entirely unserviceable; separated from the pier by a long stretch of unprotected bank there is a north revetment, partly destroyed and partly covered by sand. The south pier is 3,863 feet long and is practically ruined. Frequent dredging was required for maintenance of an 8-foot channel. Appropriations after 1882 were too small to keep the piers in proper repair. To June 30, 1906, $207,785.92 had been expended, of which $90,231.99 was for construction and $117,553.93 for maintenance, and as no further expenditures would be made on old harbor, the balance unexpended July 1, 1906, $9,453.08, was diverted to improvement of new harbor. At the present time both ends of the old channel are entirely filled with sand.

The project for the new harbor was adopted by the river and harbor act of June 3, 1896. It provides for creating a channel of 12 feet depth and navigable width by dredging the river for a distance of 1¾ miles below Saugatuck, and thence making a new cut from the river to the lake, entering the latter about 3,700 feet north of the original mouth at the old piers. The original estimate for the work was $150,000, but authority was granted on May 31, 1900, to increase this to $250,000. The river and harbor act of March 2, 1907, authorizes the maintenance of a harbor channel of sufficient depth to allow the free use of the Government dredge *General Meade*, viz, 16 feet below zero of gauge.

The project was modified by the river and harbor act of June 25, 1910, in accordance with the report printed in House Document No.

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[1] Exclusive of amount available for fiscal year 1913.

635, Sixty-first Congress, second session, so as to provide for dredging a channel from the inner ends of the piers to Saugatuck to a depth of 16 feet below zero of gauge and a width of about 90 feet, at an estimated cost of $36,000, and to maintain the whole improvement for a period of five years after the 16-foot channel has been obtained, the desirability of continuing or abandoning the harbor to be then determined.

The Annual Report of the Chief of Engineers for 1896, pages 2741–2743, and House Document No. 192, Fifty-fourth Congress, first session, contain in full the report pertaining to the adopted project for the proposed change in the location of this harbor. The House document contains also a map of the locality. Report of the examination and survey authorized by the river and harbor act of March 3, 1909, is printed in House Document No. 635, Sixty-first Congress, second session.

During the fiscal year the following work was done: For new construction the two contracts were completed November 8, 1911, (*a*) for removing the shoal and the projecting point on the left bank of the river near the inner ends of the piers, and (*b*) for continuing this channel to the town of Saugatuck; the depth in each contract was 16 feet below zero of gauge, to produce 14 feet during the navigation season, and the width 90 feet, except near the inner end of the piers, where it widened to about 250 feet. This completes the construction work of the approved project.

For maintenance the *Meade* dredged the entrance bar in Lake Michigan and the channel between the piers July 5–19, 1911, with resulting depths below zero of 18 feet and 17 feet, respectively.

To June 30, 1912, $331,238.30 had been expended under the existing project, $274,294.80 for construction and $56,943.50 for maintenance.

The pier and revetment construction and the dredging provided for by the approved project have been completed; further operations will be confined to maintenance of the whole improvement for a period of five years from November, 1911.

The available depths below zero of gauge at the close of the fiscal year were 18 feet on the entrance bar in Lake Michigan, 17 feet between the piers, and 16.2 feet in the river to deep water in Kalamazoo Lake at the town of Saugatuck, a distance of 2¼ miles from the outer ends of the piers in Lake Michigan.

The vessel freight at this harbor for the calendar year 1911 was 16,562 short tons, valued at $1,454,544, and was entirely local in character. The number of passengers carried was 14,742, and the total number of vessels, arrivals and departures, was 771.

The balance remaining from previous appropriations is $2,900, and this, together with the $9,000 in the river and harbor act of July 25, 1912, will be used as needed for dredging to maintain the required depth of channel, for repairs to piers, and contingencies. For the fiscal year ending June 30, 1914, it is recommended that $3,000 be appropriated for maintenance by dredging, repairs to piers, and contingencies.

July 1, 1911, balance unexpended		$50,000.00
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$40,730.32	
For maintenance of improvement	6,354.85	
		47,085.17

July 1, 1912, balance unexpended	$2,914.83
July 1, 1912, outstanding liabilities	2.50
July 1, 1912, balance available	2,912.33
Amount appropriated by river and harbor act approved July 25, 1912	9,000.00
Amount available for fiscal year ending June 30, 1913	11,912.33
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 3,000.00

(See Appendix L L 3.)

4. *Holland Harbor, Mich.*—The harbor is about 7 miles by water from Saugatuck Harbor on the south and 20 miles from Grand Haven Harbor on the north. When improvement was begun in August, 1867, by the United States there existed a narrow channel 5½ feet deep between piers built of brush and of irregular cribs. These had been constructed by the harbor commissioners of the adjoining town of Holland.

A project was adopted in 1867 and amended in 1873, 1879, 1884, and 1892, this project providing in general terms for a channel 12 feet deep between piers and revetments 160 feet to 213 feet apart. From 1867 to 1880 there were built by the United States piers and revetments aggregating 1,854 feet on the north side and 1,691 feet on the south side. Since the latter date there have been no additions to these structures, except, in 1889, a length of 160 feet of pile pier on the south side, designed to close a gap in the existing structure. Upon this project there was expended up to March 3, 1899, $304,217.30, of which $127,597.50 was for maintenance. The end cribs of the piers were wrecked by storms and they were removed in September, 1908; as a result, the length of the north pier at present is 1,808 feet and that of the south pier 1,639 feet.

The present project was adopted in 1905, and modified in 1907. It provides for a channel 16 feet deep, protected on the outside by two converging piers 300 feet apart at the outer end and 740 feet apart at the inner end, and on the inside by piers and revetments having a clear distance of about 205 feet at the outer end and of 162 feet at the narrowest place inside, the inner ends of the converging portions to be connected with the old piers of the inner channel by stone-filled pile structures. The project also provided for extensive repairs of the existing works. The estimated cost was $240,000.

The report upon which the present project is based is published in full in the Annual Report of the Chief of Engineers for 1897, pages 2950, 2951, and in House Document No. 272, Fifty-fourth Congress, second session. The Annual Report of the Chief of Engineers for 1905, pages 2176, 2177, contains a drawing and description of the adopted plan.

The works provided for by the approved project are completed.

During the fiscal year the *Meade* dredged the entrance bar in Lake Michigan and the channel between the piers, removing 8,048 cubic yards in December, 1911, and 10,546 cubic yards in April, 1912. This work was for maintenance.

From March 3, 1899, to June 30, 1912, there was expended $446,117.42, of which $131,109.43 was for maintenance.

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[1] Exclusive of amount available for fiscal year 1913.

The available depths below zero of gauge at the close of the fiscal year were 20 feet on the entrance bar and between the converging piers and 18 feet between the inside piers.

This harbor is relatively an important one, being at the intersection of two lines of the Pere Marquette Railroad and the terminus of the Grand Rapids, Holland & Chicago Electric Railway, which here connect with a line of steamers; these during the season of navigation run regularly to Chicago. The passenger business is especially important, but there is also a profitable freight traffic. The head of navigation is at the city of Holland, at the east end of Black Lake, about 5 miles from the entrance piers.

The vessel freight of this harbor for the calendar year 1911 was 651 arrivals and departures, with 145,801 short tons, valued at $23,194,270. The total number of passengers carried in 1911 was 56,295. The commerce at this port is about 40 per cent local and 60 per cent through traffic. Vessel freight rates to and from Chicago are about 15 per cent less than the corresponding railroad rates.

The funds available from previous appropriations are about $21,000, which will be used for dredging, for riprap if needed, and for emergencies and contingencies. This is believed to be sufficient until June 30, 1914, and therefore no estimate for additional funds is presented.

July 1, 1911, balance unexpended	$26,444.77
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	4,729.72
July 1, 1912, balance unexpended	21,715.05

(See Appendix L L 4.)

5. *Grand Haven Harbor, Mich.*—This harbor is at the mouth of Grand River, the largest river in the State of Michigan, and is about 20 miles by water north of Holland Harbor, and 12 miles south of Muskegon Harbor. Before any work had been done the natural depth at the mouth of the river varied from 9 to 12 feet, with greater depths in the inner reaches.

In 1857 the Detroit & Milwaukee Railroad Co. (Grand Trunk), whose western terminus is at the town of Grand Haven, built a pile pier 3,185 feet long upon the south side of the entrance, and also revetted, by means of close piles, portions of the bank upon the north side of the river. In 1866, when work by the United States was begun, the pile pier had been partly destroyed by fire and by storms. The available depth was 13 feet.

The present project was adopted in 1866 and amended in 1868, 1880, 1890, and 1892. It provides for the construction of parallel piers and revetments 400 feet apart, with the object of creating an entrance channel 18 feet deep at an estimated cost of $804,366.15. The amendments to the original project did not materially change its original purpose, the changes being principally in the proposed length of the piers and revetments.

During the year the following maintenance work was done: Under the contract for 8,000 tons of stone filling in the new south pier, station 30+03 to 43+87, 3,334 tons were placed; no work was done after August 15, 1911, and the time limit was waived. The contract for repairing the north revetment, station 12+12 to 18+90.5, with a pile wing from station 18+90.5 to the shore, was completed November 4, 1911. The removal of the old south pier, station 30+03 to 43+78, with Government plant was continued between August 23 and November 28; the removal of the old pile work and filling was completed between station 30+03 and 37+60 and partly removed to station 41+20; the use of the old filling in the new pier in the rear will decrease the amount of contract stone to be purchased.

The following dredging was done by the *Meade:* December 8–21, 1911, on the entrance bar in Lake Michigan and a small amount from the river opposite the Grand Trunk Railway car-ferry slip; January 7–14, 1912, on the entrance bar; in April and one day in May, 1912, about 42,000 cubic yards were removed, mostly material which had been deposited on the entrance bar by the spring flood in Grand River.

In September, 1911, the stone filling in the outer end of the south pier was renewed; in April, 1912, repairs were made to plank walk and deck ties in the south revetment station 12+00 E to 17+00 E. Repairs were made to the dredge *Saginaw* and to various pieces of floating plant.

The land belonging to the Pere Marquette Railroad Co., bordering the basin back of the south pier, was purchased for $5,000. The acquisition of the adjacent land belonging to the Pennsylvania Railroad Co. by condemnation is still in the hands of the district attorney.

To June 30, 1912, there had been expended upon the existing project the sum of $995,025.12, of which $542,976.82 was for construction and $452,048.30 for maintenance.

The approved project is completed with the exception of 250 feet of pier extension, 150 feet to the north and 100 feet to the south pier; this pier extension will be deferred for the present and entrance depths maintained by dredging alone.

The linear extent of the structures so far built is 3,538 feet in the north pier, the inner 846 feet of which (east of station 18+90.5) is in ruins, and 5,774 feet in the south pier, the inner 285 feet of which is in bad condition. The available depth below zero of gauge on the entrance bar and between the piers at the end of the fiscal year was 20 feet, but the bar in Lake Michigan at the harbor entrance is liable to return after storms or freshets and requires frequent dredging.

This harbor has for years been one of considerable importance. It is the western terminus of the Detriot, Grand Haven & Milwaukee branch of the Grand Trunk Railroad, in connection with which is run throughout the year two lines of steamers to Milwaukee; one of these, belonging to the Grand Trunk Railway, operates two large car ferries. In addition there is one line with regular trips to Chicago. All three lines do a large passenger and freight business.

The water-borne commerce at this port is about 99 per cent through traffic and has increased from 1,151 arrivals and departures, with 155,854 short tons, in 1900 to 3,099 arrivals and departures, with 641,816 short tons of cargo, valued at $65,668,660, in 1911. The local freight rates from Grand Haven to Chicago by vessel are about 15 per cent lower than the corresponding rates by railroad. The total passengers carried in 1911 was 78,738.

The balance available from previous appropriations, and after accounting for present contract liabilities, is about $68,000. This amount will be expended for repairs to existing work, for removal of old structures replaced by new work, for dredging, and for contingencies and emergencies. This balance is sufficient until June 30, 1914, and therefore no estimate for additional funds is presented, as the pier extension to complete the project has been deferred for the present.

July 1, 1911, balance unexpended	$105,393.19
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	31,475.24
July 1, 1912, balance unexpended	73,917.95
July 1, 1912, outstanding liabilities	327.07
July 1, 1912, balance available	73,590.88
July 1, 1912, amount covered by uncompleted contracts	4,962.14
Amount (estimated) required to be appropriated for completion of existing project	[1] 40,000.00

(See Appendix L L 5.)

6. Grand River, Mich.—Before any work of improvement was done upon this stream the depth in the crossings over some of the bars did not exceed 2 feet.

Between 1881 and 1886 the sum of $50,000 was expended in securing, by dredging, narrow channels through these bars with a depth of about 4 feet. No further work was done until 1896, but even then, at the expiration of over 10 years, traces of the dredged cuts were still apparent.

The former project, upon which work was begun in May, 1897, was adopted by the river and harbor act of June 3, 1896, and is based upon a report upon examination and survey reprinted in Annual Report of the Chief of Engineers for 1892, pages 2369 to 2395, and in House Document No. 197, Fifty-second Congress, first session. The project contemplated dredging a channel a distance of 38 miles from Grand Haven to Grand Rapids, with a depth of 10 feet and a width of 100 feet. The project also proposed the use of contraction works wherever necessary to increase the effect of the dredging or to render it more permanent.

The original estimated cost of project adopted in 1896 was $670,500; but the project may be said to have been modified by act of June 13, 1902, and the cost increased to not less than $774,000.

The act of March 3, 1905, modified the former project by adopting the report submitted in House Document No. 216, Fifty-eighth Congress, second session, and by providing that no portion of the money appropriated shall be used in providing a turning basin in the city of Grand Rapids.

The report referred to above recommends, on pages 4 and 5, that a channel of 6 feet depth and 100 feet width be adopted for the improvement. The estimate in the report for a 6-foot channel 100 feet wide from Fulton Street, in Grand Rapids, to Grand Haven, Mich., prepared from data furnished by the district officer, is $327,000 in addition to available plant and funds. This, together with the sum of $171,791.40 already expended toward the completion of a 6-foot channel, makes the total estimated cost of the existing project $601,791.40.

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[1] Exclusive of the balance unexpended July 1, 1912.

Report on preliminary examination and survey, respectively, is published in the Annual Report of the Chief of Engineers for 1892, pages 2369 to 2395, and in House Document No. 197, Fifty-second Congress, first session.

Report of a board of engineers on examination, with a view to regulation of floods in the interest of navigation, is printed in House Document No. 72, Sixtieth Congress, first session.

No dredging or maintenance work was done on the river during the year. Slight repairs were made to floating plant formerly in use on the river. On account of continued high water during November and December, 1911, the 124 buoys in use to mark training walls and shoals could not be taken up for the winter. In June, 1912, a general examination was made of the channel from Grand Haven to near Lamont and soundings were made on one short shoal at mile 21.5. June 29, 1912, the Government dredge *Saginaw* was towed to this bar to restore navigable depth.

To June 30, 1912, the sum of $448,488.16 had been expended in dredging 2,773,795 cubic yards of sand, clay, cobblestones, etc., in building 132,624 linear feet of training walls, and in the purchase and maintenance of plant. This sum includes $32,459.85 expended for maintenance of contraction works, $25,476.83 for maintenance of completed 6-foot channel, and $5,350.40 for purchase of land at Grand Haven.

The approved project has been about 96 per cent completed.

There still remains about 5,400 lineal feet of channel within the city limits of Grand Rapids, which have been partly dredged, with resulting depth of 6 feet and widths of 40 to 90 feet. Operations for maintenance have been confined to restoring the channel across several short bars in the portion of the river between the mouth of Bass River and Grand Haven.

The completed channel in the upper 23 miles has filled up more or less and would require maintenance dredging to be again available. High water ordinarily occurs in the early spring, and is from 12 to 18 feet above low water in the neighborhood of Grand Rapids. In the lower part of the river the difference between the high and low stages becomes less, and at the mouth it is inconsiderable.

The present depth from Grand Rapids to Lamont is not known, as this portion of the river is not in use for commercial purposes and no examination has been made since July, 1910. From Lamont to the mouth of Bass River there is probably an available depth, below standard low water of 1889, of about 4 feet, and from Bass River to Grand Haven a depth of 6 feet or more, except on two short bars, which will be dredged during July, 1912.

The commerce involved must be stated as insignificant. There is no commerce on the 17.5 miles of improved river between Grand Rapids and Lamont, but between Lamont and Grand Haven, a distance of about 21 miles, a side-wheel steamer, with draft of 24 inches, has been in operation since July, 1911. Below Bass River three small tugs are engaged in towing gravel to Grand Haven; two of these tugs can also run on Lake Michigan.

The freight carried in 1911 amounted to 49,718 short tons, valued at $68,407, of which 6,000 tons were logs in rafts and 42,616 tons gravel towed on scows.

The improvement has no effect on freight rates, and it is improbable that it ever will have, since the better facilities afforded by the competing interurban electric lines to Holland, Grand Haven, and Muskegon have served to divert to them freight shipped by vessel to and from Chicago, which might otherwise have been regarded as peculiarly tributary to a line of steamers running between Grand Rapids and Grand Haven and connecting at the latter place with translake steamships.

The available balance is about $14,000, of which $5,000 will be applied to the purchase of land at Grand Haven Harbor for storage and repair purposes, leaving a balance of about $9,000, which will be sufficient for maintenance of channel depths in the used portion of the river between Grand Haven and Lamont and for repairs and additions to plant as may be needed for this use.

July 1, 1911, balance unexpended	$21,531.44
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	6,403.45
July 1, 1912, balance unexpended	15,127.99
July 1, 1912, outstanding liabilities	586.47
July 1, 1912, balance available	14,541.52
Amount (estimated) required to be appropriated for completion of existing project	[1] 149,000.00

(See Appendix L L 6.)

7. *Muskegon Harbor, Mich.*—This harbor is about 12 miles by water from Grand Haven Harbor on the south and 11½ miles from White Lake Harbor on the north, and is the outlet of Muskegon River, one of the largest in Michigan, which before emptying into Lake Michigan expands into Muskegon Lake. The channel between the lakes in 1867, before operations were begun by the United States, was 3,000 feet long and about 12 feet deep, except at the entrance, where the depth was 11 feet and the channel fluctuating. By private enterprise the entrance had been protected by converging slab piers.

The original project was adopted in 1866 and amended in 1869, 1873, 1881, 1884, 1890, and 1892. To June 30, 1902, there had been expended upon this project the sum of $526,293.36, of which $388,218.42 was for construction and $138,074.94 for maintenance, and there had been constructed a north pier and revetment 2,780 feet long and a south pier and revetment 4,402 feet long, protecting a channel varying in width from 308 feet at the entrance to 167 feet inside and having a proposed depth of 15 feet.

The existing project, adopted by the act of June 13, 1902, provides for widening the channel to 300 feet and deepening it to 20 feet from Lake Michigan to Muskegon Lake. This involved the removal of the narrowing portion of the north pier and revetment, the reconstruction of the same on new line, the extension of both revetments to Muskegon Lake, and the outward extension of the two piers by an aggregate amount of 550 feet. The estimated cost was $380,000.

Reports upon preliminary examinations are found in the Annual Report of the Chief of Engineers for 1901, pages 3131–3134, in House

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[1] Exclusive of the balance unexpended July 1, 1912.

Document No. 104, Fifty-sixth Congress, second session, and in House Document No. 210, Sixty-first Congress, second session.

House Document No. 104, Fifty-sixth Congress, second session, contains the latest published map of the locality.

The operations during the fiscal year were as follows: For new work the contract for dredging the channel between the piers from lake to lake to a depth of 22 feet below zero of gauge was completed October 16, 1911, and completes the project dredging. The contract for completion of the north revetment by an extension of 1,100 feet to Muskegon Lake was completed November 16, 1911.

For maintenance: Dredging by the *Meade* November 10–31 and December 22 to January 6, 1912, restored navigable depths on the entrance bar in Lake Michigan where a shoal, with a least depth of 15 feet actual water, had been formed by two different storms. The *Meade* was again employed May 31 to June 1, 1912, to remove the entrance bar. In October and November, 1911, an attempt was made to repair the damage to the outer end of the south pier caused by a colliding vessel, but on account of severe weather conditions only temporary repairs could be made.

From July 1, 1902, to June 30, 1912, there was expended upon the existing project the sum of $338,847.07, of which $225,189.54 was for construction and $113,657.53 for maintenance.

The approved project is completed with the exception of 550 feet of pier extension, 350 feet to the north, and 200 feet to the south piers; this pier extension will be deferred for the present and entrance depths maintained by dredging alone.

The length of the completed pier and revetment construction at the present time is 4,250 feet on the north side and 4,710 feet on the south side of the channel, and the maximum draft on June 30, 1912, was 22 feet below zero of gauge. The head of navigation is at the city of Muskegon at the east end of Muskegon Lake, about 5 miles from the entrance piers.

Commerce at this port for 1911 comprised 953 arrivals and departures, with 114,015 short tons of cargo valued at $6,339,136, and was about 75 per cent local and 25 per cent through traffic. The local freight rates from Muskegon to Chicago by vessel are about 15 per cent lower than the corresponding rates by railroad. The total number of passengers carried in 1911 was 54,739.

During the season of navigation two lines of steamers regularly use this harbor. Their business is a substantial one, and with increased facilities should grow considerably. A general freight and passenger business is done, and in the summer months this is largely augmented by the fruit and the resort traffic. Muskegon Lake itself is a magnificent harbor, 5 miles long and about 1½ miles wide, with depths varying from 30 to 40 feet. This is an excellent harbor of refuge. The city of Muskegon has one through railroad line and is the terminus for two others as well as for one electric interurban line.

The available balance from previous appropriations is about $16,000 which will be sufficient for maintenace and contingencies to June 30, 1914, and no estimate therefore is presented for additional funds as the pier extension to complete the project has been deferred for the present.

July 1, 1911, balance unexpended		$80,630.55
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$57,212.10	
For maintenance of improvement	6,935.21	
		64,147.31
July 1, 1912, balance unexpended		16,483.24
July 1, 1912, outstanding liabilities		307.82
July 1, 1912, balance available		16,175.42
Amount (estimated) required to be appropriated for completion of existing project		[1]66,000.00

(See Appendix L L 7.)

8. *White Lake and Pentwater Harbors, Mich.*—These harbors were formerly carried as separate works, but are now consolidated in consequence of a provision in the river and harbor act of June 13, 1902.

(*a*) *White Lake Harbor.*—This harbor is about 11½ miles by water from Muskegon Harbor on the south and 32 miles from Pentwater Harbor on the north. When the present project was adopted the natural outlet of White Lake, about 3,550 feet north of the present entrance, afforded a channel 5 feet deep and 125 feet wide between slab piers built by local enterprise.

The approved project provided for the abandonment of the old outlet and the creation of a new one, 12 feet deep and 200 feet wide, between piers and revetments. This project was adopted in 1866, amended in 1873, 1884, and 1892, the present amended estimated cost being $353,550. The various amendments to the original project have not altered it materially, as they relate principally to the length of the proposed piers and revetments. The provision in the act approved March 2, 1907, that "the Secretary of War is authorized to dredge the channel at Pentwater to the depth of 16 feet and to dredge the channel at White Lake to sufficient depth to allow the free use of the Government dredge *Meade*, may be said to have changed the project to one of 16-foot depth below zero of gauge and 200 feet width between piers and revetments.

Report on preliminary examination is printed in House Document No. 323, Sixty-first Congress, second session, and reviewed in Rivers and Harbors Committee Document No. 11, Sixty-first Congress, second session.

The last published map of the locality is contained in the Annual Report of the Chief of Engineers for 1884, page 1982.

A preliminary examination of this harbor was called for by the river and harbor act of February 27, 1911, and report thereon will be submitted to Congress at its next session.

The operations during the year have consisted in dredging for maintenance by the *Meade* in July, 1911, and in May, 1912, to restore navigable depths on the outer bar and between the piers, with resulting depths below zero of gauge June 30, 1912, of 18 feet on the bar and 16 feet between the piers.

To June 30, 1912, there was expended upon the existing project the sum of $366,994.03, of which $207,862.44 was for construction and $159,131.59 for maintenance.

The proportion of the approved project completed to June 30, 1912, is about 91 per cent, there being still required 50 feet extension to the north pier and 100 feet extension to the south pier. The existing constructions consist of a north pier and revetment 1,715 feet long and of a south pier and revetment 1,953 feet long, and the natural depth of channel between them is about 10 feet. Periodical dredging is necessary to secure and maintain a depth of 16 feet below zero of gauge. The maximum draft that could be carried over the shoalest part of the channel at the end of the fiscal year was 14.5 feet. The head of navigation is at the towns of Whitehall and Montague, at the east end of White Lake and about 4½ miles from the entrance piers.

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[1] Exclusive of the balance unexpended July 1, 1912.

In 1911 there were at this harbor 180 arrivals and departures, with 16,583 short tons of cargo, valued at $2,672,771, and entirely local in character. The total number of passengers carried in 1911 was 12,750. The local freight rates by vessel from White Lake to Chicago are about 15 per cent less than the corresponding rates by railroad.

The available balance from previous appropriations and allotments is about $7,000, which will be used for maintaining a practicable channel depth by dredging. White Lake Harbor was heretofore reported not only unworthy of improvement, but also unworthy of maintenance, by the United States, and it was recommended that further appropriations for the harbor be discontinued. (Annual Report of 1909, pp. 739 and 2040, and H. Doc. No. 323, 61st Cong., 2d sess., p. 2.)

There still remains in the Treasury a balance of $51,000 from the river and harbor act of March 3, 1909, which may be allotted for maintenance.

(*b*) *Pentwater Harbor.*—This harbor is about 32 miles by water from White Lake Harbor on the south and 11½ miles from Ludington Harbor on the north. Before work was begun at this harbor by the United States there existed an irregular channel 4 feet deep and 75 feet wide between slab piers built by local enterprise.

The existing project, adopted in 1867 and amended in 1873, 1884, and 1892, provides for widening the old entrance to 150 feet and deepening it to 12 feet, the sides being protected by piers and revetments. Estimated cost was $327,713.40. The amendments to the original project relate merely to the length of the proposed piers and revetments and in nowise enlarge its original scope. The present project, by reason of the provision in the act of March 2, 1907, contemplates a channel 16 feet deep below zero of gauge and about 150 feet wide, protected by suitable piers and revetments.

Report on preliminary examination is printed in House Document No. 181, Fifty-ninth Congress, second session, and reviewed in Rivers and Harbors Committee Document No. 11, Sixty-first Congress, second session.

A preliminary examination of this harbor was directed by the river and harbor act of February 27, 1911, and report thereon will be submitted to Congress at its next session.

The operations for maintenance during the year have consisted in dredging by the *Meade*, July 20 to August 4 and November 8–9, 1911, and June 3–15, 1912, to restore navigable depths on the entrance bar in Lake Michigan and between the piers, with resulting depths, below zero of gauge, June 30, 1912, of 18 feet on the bar and 16 feet between the piers.

To June 30, 1912, there was expended the sum of $331,280.84, of which $179,899.10 was for construction and $151,381.74 for maintenance.

The proportion of the approved project completed to June 30, 1912, is about 85 per cent, there being still required 200 feet extension to the south pier.

The result is a channel 140 to 153 feet wide, whose natural depth is from 9 to 10 feet, protected by a north pier and revetment originally 2,226 feet long, the outer 80 feet of which is now badly wrecked, and by a south pier and revetment 1,847 feet long; from the inner end of the south revetment to Pentwater Lake is a dilapidated revetment belonging to the railroad company. Periodical dredging is necessary to secure the projected depth. The maximum draft which on June 30, 1912, could be carried over the shoalest point in the improved channel was about 14.5 feet. Pentwater Lake is about 2 miles long, one-half mile wide, and 20 feet to 50 feet deep in the western part, with decreasing depths in the eastern part.

The lake commerce at this port for 1911 consisted of 780 arrivals and departures, with 4,419 short tons of cargo, valued at $257,375, and was entirely of local character. The number of passengers carried in 1911 was 10,200. The local freight rates by vessel to Chicago are about 29 per cent less than the corresponding rates by railroad.

The available balance from previous appropriations and allotments is about $1,200, which will be expended for dredging and minor repairs to piers. Pentwater Harbor was heretofore reported unworthy of improvement by the United States, and it was recommended that further appropriations for the harbor be discontinued. There still remains in the Treasury a balance of $15,000 (river and harbor act of Mar. 3, 1909) which may be allotted for maintenance.

WHITE LAKE HARBOR.

July 1, 1911, balance unexpended	$13,399.14
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	5,691.87
July 1, 1912, balance unexpended	7,707.27
July 1, 1912, outstanding liabilities	415.25
July 1, 1912, balance available	7,292.02
Amount (estimated) required to be appropriated for completion of existing project	[1] 21,720.00

PENTWATER HARBOR.

July 1, 1911, balance unexpended	$3,278.43
Amount allotted from appropriation made by river and harbor act approved March 3, 1909	3,000.00
	6,278.43
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,739.27
July 1, 1912, balance unexpended	3,539.16
July 1, 1912, outstanding liabilities	2,333.69
July 1, 1912, balance available	1,205.47
Amount (estimated) required to be appropriated for completion of existing project	[1] 26,400.00

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[1] Exclusive of the balance unexpended July 1, 1912.

CONSOLIDATED.

July 1, 1911, balance unexpended	$16,677.57
Amount allotted from appropriation made by river and harbor act approved Mar. 3, 1909	3,000.00
	19,677.57
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	8,431.14
July 1, 1912, balance unexpended	11,246.43
July 1, 1912, outstanding liabilities	2,748.94
July 1, 1912, balance available	8,497.49
Amount (estimated) required to be appropriated for completion of existing project	[1] 48,120.00

(See Appendix L L 8.)

9. Ludington Harbor, Mich.—This harbor is the outlet of Pere Marquette River, which expands into Pere Marquette Lake before emptying into Lake Michigan and by water is about 11½ miles from Pentwater Harbor on the south and 24 miles from Manistee Harbor on the north. In 1867, before improvement was begun by the United States, the outlet from Pere Marquette Lake to Lake Michigan had a length of 830 feet, protected by diverging slab piers. The entering depth was 7 to 8 feet.

The former project was adopted in 1867 and modified in 1885, 1889, 1890, and 1899. In its final form, as adopted by the river and harbor act of March 3, 1899, it provided for a through channel 183 to 285 feet wide and 18 feet deep, protected by the requisite piers and revetments. The estimated amount required to complete the revised project was $210,000. The development of the harbor has been progressive, the changes in the original project affecting only the length of the piers, their direction and the depth between them. It may therefore be said that the estimated cost of completion of that project is really the sum of the above amount and that previously expended, or $591,055.91 in all. The total amount expended upon that project was $617,867.72, of which $491,416.22 was for construction and $126,451.50 for maintenance, to July 1, 1907.

The present project, as adopted by the act of Congress of March 2, 1907, provides for an interior channel 18 feet deep, protected by piers and revetments, and for an exterior basin, to be formed by two breakwaters, each 1,800 feet long, 400 feet apart at the outer ends and diverging at an angle of 90 degrees, the inner ends of the breakwaters to be connected with the shore by suitable structures; for the removal of the lakeward ends of the two inside piers, and for dredging an area in the basin after the removal of the ends of the inside piers. The estimated cost of this project was $839,087. A continuing contract for the construction of the breakwaters, not including the shore connections, was entered into under date of December 10, 1907, and completed May 18, 1911, the remaining work to be placed under contract at a later date.

Report of a survey is published in the Annual Report of the Chief of Engineers for 1897, pages 2951–2953, and in House Document No.

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[1] Exclusive of the balance unexpended July 1, 1912.

273, Fifty-fourth Congress, second session. This document contains a map of the locality.

The report upon which the project of 1907 is based is printed in House Document No. 62, Fifty-ninth Congress, first session, and is reviewed in Rivers and Harbors Committee Document No. 46, Sixty-first Congress, second session.

Operations during the fiscal year were as follows:

For new work: An emergency contract was entered into July 19, 1911, for additional riprap and stone filling for the breakwaters; from August 27 to December 15, 1911, 8,646.6 tons of 3-ton riprap, 2,145.6 tons of 500-pound riprap, and 1,274.2 tons of 100-pound stone were placed, due to the loss, December 2 in open lake, of one barge load of stone the contract was not completed. A contract was entered into April 18, 1912, for removing the outer 400 feet of the north pier and the outer 500 feet of the south pier, for placing 800 feet of the removed cribs in the shore connection to the south breakwater, and for completing the south shore connection. Work under this contract was begun June 10, 1912, and at the end of the month the stone and superstructure of the outer end crib in each pier had been partly removed.

For maintenance: The repairs to the damaged steel plates from the lake face of the south breakwater were completed and the repaired plates were replaced, the work was completed August 13. Dredging by the *Meade* October 12 to November 6, 1911, restored a depth below zero of gauge of 22 feet in the entrance basin and widened the 20-foot channel between the piers. Dredging November 13–15 removed a shoal between the inside piers caused by the grounding, and removal, of an overloaded vessel. Soundings of May 31, 1912, showed available depths, below zero of gauge, of 20.5 feet in the entrance basin and 20 feet between the inside piers.

The amount expended under the present project from July 1, 1907, to June 30, 1912, was $754,875.48, of which $725,381.27 was for new work and $29,494.21 for maintenance.

The sum of $19,076.98 was expended to settle claim made by the contractor for damage to the south breakwater. (Annual Report of 1911, p. 875.)

The existing project gave authority for entering into continuing contracts to complete the improvement at a cost not to exceed $839,087, which amount has been appropriated. It was necessary to increase the estimated cost of the project by $51,500 on account of additional riprap and stone filling made necessary by settlement of same during the time of construction, and this amount was appropriated by the river and harbor act of July 25, 1912.

The original project for the interior harbor is completed. The proportion of the project of 1907 completed, to June 30, 1912, is 81 per cent. The maximum draft that could be carried at the end of the fiscal year was about 18.5 feet, the depth of channel being 20 feet below zero of gauge. There now exists a reasonably reliable 18-foot channel, protected by piers and revetments. Annual dredging is necessary, however, to maintain a channel 18 feet in depth and of sufficient width. The lengths of the harbor structures are as follows: North breakwater, 1,800 feet; south breakwater, 1,800 feet; interior channel, north pier and revetment, 2,440 feet, and south pier and revetment, 2,481 feet. The width of the breakwater entrance is 400 feet and the width between the piers 273 feet at the outer end, narrowing to 183 feet at the inner end, which connects with Pere Marquette Lake about 2 miles long, one-half mile wide, and 20 feet to 40 feet deep.

The water-borne commerce at this harbor for 1911 consisted of 5,658 arrivals and departures, with 1,865,272 short tons of cargo, valued at $108,564,055, and was general in character. The number of pasengers carried in 1911 was 43,653. The local freight rates by vessel to Chicago are about 27 per cent less than the corresponding rates by railroad.

This harbor is one terminus of the main line of the Pere Marquette Railroad Co., which operates lines of car ferries from this point to Manitowoc, Wis., and Milwaukee, Wis. Lines of passenger and package freight steamers also make regular sailings to Milwaukee, Chicago, and east shore harbors to the north. The business done by the car-ferry lines is of large and constantly-increasing importance in its effect upon freight rates to and from the Northwest. The effect of the improvement has been to create a class of traffic which, in the absence of a deep and readily available channel, could never have existed. There has thus been provided a shorter route for the products of the upper Mississippi Valley, which has the additional merit of avoiding the congestion usually existing on the railroads at the south end of Lake Michigan. Freight rates are believed to have been materially reduced by this route.

The balance on hand for new construction is about $14,000, and the expenditure of this, together with the $51,500 appropriated by the river and harbor act of 1912, has been authorized for the completion of the breakwater project. This work is under contract, except dredging an area in the basin after the removal of the lakeward ends of the inside piers, and if additional appropriation is required for this dredging an estimate will be submitted at a later date.

The available balance for maintenance is about $13,000, which will be expended for maintenance by dredging, general repairs, and for contingencies to June 30, 1913. For the year ending June 30, 1914, it is recommended that $5,000 be appropriated for maintenance by dredging, general repairs, and for contingencies.

July 1, 1911, balance unexpended		$209,632.79
Miscellaneous receipts		106.29
		209,739.08
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$43,359.88	
For maintenance of improvement	8,494.59	
		[1] 51,854.47
July 1, 1912, balance unexpended		[2] 157,884.61
July 1, 1912, outstanding liabilities		267.64
July 1, 1912, balance available		157,616.97
Amount appropriated by river and harbor act approved July 25, 1912		51,500.00
Amount available for fiscal year ending June 30, 1913		209,116.97

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[1] Exclusive of $111.79 expended account Isthmian Canal Commission.

[2] Inclusive of $58.80 to be reimbursed by Isthmian Canal Commission.

July 1, 1912, amount covered by uncompleted contracts	$130,182.28
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

(See Appendix L L 9.)

10. Manistee Harbor, Mich.—This harbor is distant by water about 24 miles from Ludington Harbor on the south and 8 miles from Portage Lake Harbor on the north. In 1866, previous to the beginning of work by the United States, the entrance to this harbor was improved by slab piers, 100 to 150 feet apart, built by local enterprise, a navigable depth of 7 to 8 feet being thereby maintained.

The project adopted in 1867 and amended in 1871, 1873, 1875, 1884, 1890, and 1892, provides for a channel of navigable width with a depth of 15 feet, extending from Lake Michigan to Manistee Lake, protected by piers and revetments at the entrance. The various modifications of the original project merely extended its limits, changed the proposed length of the piers, and the proposed depth from 12 to 15 feet.

The act approved March 2, 1907, changed the project by providing for improvement in accordance with the report submitted in House Document No. 511, Fifty-ninth Congress, first session, which contemplates securing a uniform depth of 18 feet, by dredging to a depth of 20 feet, pier extension, revetment, and protection works, at an estimated cost of $147,488, provided satisfactory pledge is given that certain private and municipal work will be completed within a reasonable time, that land for the improvement will be donated, and that the United States will be protected from claims for damages which may result from the work. The pledges required by the act of March 2, 1907, were not given, and the river and harbor act of June 25, 1910, again modified the project by providing for dredging a channel 18 feet in depth at low water between the piers and 16 feet in depth through the river to Manistee Lake, without any limiting requirements, in accordance with plan submitted in House Document No. 705, Sixty-first Congress, second session. The estimated cost of this dredging was $25,000.

The river and harbor act approved July 25, 1912, adopted a new project, in accordance with report printed in House Document No. 599, Sixty-second Congress, second session, which contemplates providing an enlarged harbor entrance to include (*a*) the construction of a south breakwater 1,300 feet long, with shore connection about 1,200 feet long, removal of 450 feet of the lakeward end of south pier, and dredging an entrance basin and the channel between the piers to a depth of 20 feet below low water; (*b*) dredging Manistee River from the inner end of the north pier to Manistee Lake to a depth of 18 feet below low water; (*c*) the extension of the north pier 200 feet (if required); and (*d*) the maintenance of the project. The estimated cost is $456,000 for first construction and $6,000 annually for maintenance, and is made contingent upon the donation, without cost to the United States, of a strip of land at the shore line at least 200 feet wide, 100 feet on each side of the center line of the shore connection of the breakwater, and 200 feet long, to insure free access to the pier and full control of the same.

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[1] Exclusive of amount available for fiscal year 1913.

Reports on preliminary examinations and surveys, respectively, are printed in House Document No. 511, Fifty-ninth Congress, first session, in House Document No. 705, Sixty-first Congress, second session, and in House Document No. 599, Sixty-second Congress, second session, with map.

A complete map of this locality accompanies House Document No. 511, Fifty-ninth Congress, first session.

The following operations were carried on during the last fiscal year:

For new construction.—The dredging by contract in the river from the inner end of the north pier to Manistee Lake, a distance of about 6,500 feet, to a depth of 18 feet below zero of gauge to provide the project depth of 16 feet at low water, was completed September 12, 1911. Dredging by the *Meade*, September 18–October 11, 1911, removed 28,547 cubic yards, which is a portion of the project dredging. A contract was entered into April 26, 1912, with Greiling Bros. Co. for completing the project dredging between the piers, but no work was done up to June 30.

For maintenance.—Dredging by the *Meade*, August 14–26, 1911, gave resulting depths, below zero of gauge, of 22 feet on the entrance bar in Lake Michigan and 18 feet between the piers. The contract of April 26, 1912, referred to above, provided also for dredging in the river to restore navigable depths where the completed channel had filled in since last season; a small amount of work was done between May 25 and June 6 and the project depth of 16 feet at low water (18 feet below zero) was restored. Soundings completed May 3, 1912, showed available depths below zero of gauge of 21.4 feet on the entrance bar, 18.2 feet between the piers, and 15 feet in the river.

To June 30, 1912, there had been expended $499,134.83, of which $351,196.67 was for construction and $147,938.16 for maintenance.

The original project is completed with the exception of 100 feet extension of the south pier, and this is canceled with the adoption of the new project in the river and harbor act of 1912. The project modification of the act of June 25, 1910, is completed with the exception of the dredging between the piers which is now under contract.

As a result of the above total expenditure to June 30, 1912, there had been built 2,906 linear feet of north and 1,450 linear feet of south pier and revetment, the width between the piers varying between 150 feet inside and 190 feet at the outer end of the south pier, which is 250 feet shorter than the north pier. The portion of the north revetment occupied by the Manistee & Northeastern Railroad Co., referred to in the Annual Report of the Chief of Engineers for 1899, page 2940, still remains without repairs. The outer end of the north pier has been badly damaged by a colliding vessel and by storms and needs repairs. Navigation extends to the head of Manistee Lake, which is about 4 miles long, ¼ to ½ mile wide, and over 30 feet deep. The maximum draft that could be carried at the end of the fiscal year was about 16.5 feet (18 feet below zero of gauge) in the river.

The vessel commerce at this port in 1911 amounted to 1,618 arrivals and departures, with 320,820 short tons of cargo valued at

$3,763,626, principally local in character. The number of passengers carried in 1911 was 29,359. Definite information as to the effect of the improvement upon freight rates could not be obtained, but the local freight rates by vessels from Manistee to Chicago are about 30 per cent less than the corresponding rates by railroad.

The commerce tributary to this harbor is derived principally from the salt and lumber industries. The harbor is also a regular port of call for one line of steamers plying from Chicago to points upon the east shore of Lake Michigan, and a single steamer makes stated trips from Manistee to Milwaukee. There are three railroads running into Manistee—the Pere Marquette, the Manistee & Grand Rapids, and the Manistee & Northeastern.

The river and harbor act of 1912 appropriates $150,000 for an enlarged harbor entrance in accordance with the new project, which it is estimated will provide for the construction of about 700 feet of the breakwater. The remainder of the breakwater, the removal of the inside pier, and the shore connection must be let in one contract, as portions of the pier are to be used in the other two structures. It is recommended, therefore, that prior to June 30, 1914, there be appropriated for this purpose $240,000, which is the balance of the estimated cost of this portion of the project.

The balance available from previous appropriations for maintenance is about $12,000, which will probably be sufficient to June 30, 1913, provided no unusual contingencies arise. For the year ending June 30, 1914, for maintenance by dredging, general repairs, and for contingencies, it is recomended that $6,000 be appropriated.

July 1, 1911, balance unexpended		$41, 292. 55
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$21, 035. 87	
For maintenance of improvement	4, 366. 64	
		25, 402. 51
July 1, 1912, balance unexpended		15, 890. 04
July 1, 1912, outstanding liabilities		23. 33
July 1, 1912, balance available		15, 866. 71
Amount appropriated by river and harbor act approved July 25, 1912		150, 000. 00
Amount available for fiscal year ending June 30, 1913		165, 866. 71
July 1, 1912, amount covered by uncompleted contracts		3. 663. 90
Amount (estimated) required to be appropriated for completion of existing project		[1] 306, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 246, 000. 00

(See Appendix L L 10.)

11. Harbor of refuge at Portage Lake, Manistee County, Mich.—This harbor is distant by water about 8 miles from Manistee Harbor on the south and 19 miles from Frankfort Harbor on the north. In 1879, when work was begun by the United States, there was a channel 4 feet deep and 130 feet wide between slab piers built by local enterprise.

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[1] Exclusive of amount available for fiscal year 1913.

The approved project, adopted in 1879 and amended in 1881 and 1890, contemplates the construction of a harbor of refuge, with an entrance from Lake Michigan 356 feet wide and 18 feet deep, protected by piers and revetments. Estimated cost, revised in 1897 and 1899, was $344,300.

The modifications of the original project have in no way changed its scope, so that essentially the project is to-day as when originally adopted. All expenditures made up to the present time have contributed to the completion of the project in its present form.

To June 30, 1912, there had been expended the sum of $388,931.94, of which $254,129.21 was for construction and $134,802.73 for maintenance.

The last published map of this locality is found in the Annual Report of the Chief of Engineers for 1884, page 1974.

The operations during the fiscal year have consisted in dredging for maintenance by the dredge *Meade*, August 5–12, 1911, the depth on the entrance bar, below zero of gauge, was increased from 15 feet to 20 feet, and September 9–16, 1911, the channel between the piers was dredged to a depth below zero of gauge of 18.5 feet.

The approved project is completed as far as pier construction is concerned, but the dredging to the proposed width and depth remains as yet incomplete.

The harbor structures are in good condition. The north pier, comprising 114 feet of pilework in wing at inner end, 1,235 feet of pilework along channel, and 851 feet of cribwork, has a total length of 2,200 feet. The south pier, comprising 1,399 feet of pilework, including 17 feet of wing at east end, and 901 feet of cribwork, has a total length of 2,300 feet. Navigation extends to the town of Onekama at the inner end of Portage Lake, which is a body of water about 3½ miles long, with a maximum width of about 1½ miles and with two central areas with depths of 20 feet or more.

The maximum draft that could be carried at the end of the fiscal year was about 16.5 feet (for a depth of 18 feet below zero of gauge).

The vessel commerce at this harbor for 1911 was 630 arrivals and departures, with 2,100 short tons of cargo, valued at $124,500, and was entirely local in character. The number of passengers carried in 1911 was 6,887.

This harbor is one practically destitute of local or through commerce and has never been available as a harbor of refuge, although planned 33 years ago for this specific purpose, the funds never having been available for its completion. Conditions have so changed that there is no longer any need of a harbor of refuge in this locality, as the excellent harbors at Ludington, Manistee, and Frankfort are ample for all such needs, and, if completed, it is doubtful if it would be used by the larger local vessels, and improbable that it would ever be used by the large inter-lake vessels for which it was first planned.

The Chief of Engineers therefore recommends the abandonment of further work on the project as a harbor of refuge, and he is further of the opinion that this locality is not worthy of any further expenditures by the United States in the interest of general commerce and navigation, and recommends the entire abandonment of the project.

For detailed reasons for this recommendation, see report of the local officer printed in Appendix L L 11 of this report.

July 1, 1911, balance unexpended	$7,563.20
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	3,995.14
July 1, 1912, balance unexpended	3,568.06
Amount appropriated by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	6,568.06

(See Appendix L L 11.)

12. Arcadia Harbor, Mich.—This harbor is distant by water about 9 miles from Portage Lake Harbor on the south and 10 miles from Frankfort Harbor on the north. The act of March 3, 1905, appropriated $6,000 for the improvement of this harbor in accordance with report submitted in House Document No. 194, Fifty-eighth Congress, second session.

While a plan was submitted for rebuilding the piers at a cost of $90,390, and annual maintenance and dredging at a cost of $5,200, the plan that was recommended and approved was for maintenance of the present channel by dredging only, at a cost of $3,000 annually for a period of five years, at the end of which time, if a growth of the commerce had been manifested such as to warrant larger expenditures, the plan for radical improvement by reconstruction of the piers could be undertaken. At the time of the survey—September, 1902—the depth was some 12 feet in a narrow and rather difficult channel, produced and maintained by repeated dredging at local expense, and this depth was subject to considerable reduction during the usual lowering of the lake surface in the months of October and April, so that only 10 feet could be safely counted on as the navigable depth. The piers terminate at the 10-foot contour.

The approved project was completed in 1909 by reason of the expiration of the authorized period of five years for maintenance by dredging. A report upon preliminary examination made under authority of the river and harbor act of 1910, and printed in House Document No. 701, Sixty-second Congress, second session, was adverse to the further improvement of the harbor.

A report on preliminary examination is published in House Document No. 132, Fifty-sixth Congress, first session, and in annual report of 1900, pages 3942–3946. Report on a survey is published in the Annual Report of the Chief of Engineers for 1904, pages 3037–3048, and in House Document No. 194, Fifty-eighth Congress, second session. Report on preliminary examination is published in House Document No. 321, Sixty-first Congress, second session, and reviewed in Rivers and Harbors Committee Document No. 10, Sixty-first Congress, second session. Report on a preliminary examination is published in House Document No. 701, Sixty-second Congress, second session.

There is no project at the present time for the improvement of this harbor, present operations being for maintenance.

The operations during the fiscal year have been dredging for maintenance to restore navigable depth between the piers and across the bar in Lake Michigan and minor repairs to piers. The dredging under special agreement was completed July 12, 1911, producing a channel about 13.5 feet deep below zero of gauge and about 50 feet wide. Dredging by the *Meade*, September 7, 8, and 13, 1911, on the entrance bar in Lake Michigan increased the depth below zero of gauge from about 14 feet to about 16 feet for a width of about 200 feet. April 26, 1912, a contract was entered into for dredging a channel 60 feet wide and 16 feet deep below zero of gauge from lake to lake and was completed June 29, 1912. Repairs by day labor and purchased material were made July 11 to August 16 and September 26 to October 10, 1911, to the portions of both piers which were in the most dilapidated and unsafe condition; the old filling was overhauled and renewed with slabs and stone filling, a few new channel piles driven, and slight repairs made to deck and supporting crossties. Soundings of May 6–8, 1912, showed available depths below zero of gauge of 14 feet on the entrance bar and 10.3 feet between the piers.

To June 30, 1912, there had been expended $20,629.04 for maintenance.

The maximum draft that could be carried June 30, 1912, was about 14.5 feet, the available depth being 16 feet below zero of gauge. The channel which requires dredging is about 2,000 feet long from lake to lake. On account of the condition of the piers and their short length the results of dredging are only temporary. The channel which requires dredging extends 700 feet beyond the outer end of the north pier, and this portion is exposed to open lake storms and is easily obliterated. Navigation extends to the village of Arcadia at the north end of North Bar Lake, which is about 4,800 feet long north and south, with depths of 20 feet or more.

The vessel commerce for this harbor in 1911 amounts to 389 arrivals and departures, with 18,455 short tons of cargo valued at $347,671, entirely local in character. The number of passengers carried in 1911 was 3,637. Definite information as to the effect of this harbor on freight rates could not be ascertained as the Arcadia & Betsie Railroad into this town does not do an interstate business.

The balance on hand and available June 30, 1912, is $3,819.63, the most of which will be required to pay for additional dredging to be done by the *Meade* in the first week of July, 1912. The river and harbor act of July 25, 1912, appropriates $15,000 for improvement and maintenance, which it is proposed to expend during the fiscal years ending June 30, 1913, and June 30, 1914, for maintenance by dredging to maintain a channel between the piers and across the bar in Lake Michigan and for temporary repairs to the piers when found necessary, as the pier structures are uniformly in such bad condition that it is not deemed advisable to spend small appropriations in constructing short lengths of new work.

July 1, 1911, balance unexpended	$9,947.54
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	5,576.58
July 1, 1912, balance unexpended	4,370.96
July 1, 1912, outstanding liabilities	551.33
July 1, 1912, balance available	3,819.63
Amount appropriated by river and harbor act approved July 25, 1912	15,000.00
Amount available for fiscal year ending June 30, 1913	18,819.63
July 1, 1912, amount covered by uncompleted contracts	2,834.40

(See Appendix L L 12.)

13. Frankfort Harbor, Mich.—This harbor is distant by water about 10 miles from Arcadia Harbor on the south and about 30 miles from the natural harbor of South Manitou on the north. In 1867, when the United States began work of improvement at this harbor, which is the entrance to Lake Aux Becs Scies, there existed an outlet about 750 feet north of the present channel, affording a depth of 3 to 4 feet and width of 70 to 80 feet between slab piers, built by local enterprise.

The project, adopted in 1866 and amended in 1868, 1879, and 1892, provided for a new outlet, with channel 12 feet deep and 200 feet wide, protected by piers and revetments. The estimated cost, revised in 1897 in compliance with the river and harbor act of June 3, 1896, to cover the cost of securing a channel 18 feet deep, was $413,659.85; further revised in 1899 to $421,938.35. The changes in the original project have been in effect merely extensions, so that the existing project does not differ in kind from the original one. All expenditures may therefore justly be regarded as pertaining to the present project.

To June 30, 1912, there had been expended the sum of $492,230.57, of which $351,353.59 was for construction and $140,876.98 for maintenance.

The last published map of this harbor is found in the Annual Report of the Chief of Engineers for 1884, page 1973.

Operations during the fiscal year: For new work the extension of the north pier by one crib 100 feet long, by contract, was continued and completed October 20, 1911. This completes the project.

For maintenance: The dredge *Meade* was employed August 28 to September 6, 1911, and restored navigable depths on the entrance bar in Lake Michigan and between the piers. Soundings of May 10–14, 1912, showed available depths below zero of gauge of 19.7 feet on the entrance bar and 20 feet between the piers. Dredging by the *Meade* June 22–29, 1912, gave a resulting depth below zero of gauge of 22 feet on the bar and the channel of 20-foot water (below zero) between the piers was widened to 120, or more, feet.

The approved project is completed and has resulted in the creation and maintenance of a channel 18 feet deep (about 20 feet below zero of gauge), whose natural depth, or depth to which the channel would probably shoal in a few years without dredging, is 12 feet, the width being 200 feet. It is protected by a north pier and revetment 2,000 feet long and a south pier and revetment 2,028 feet long, of which 116 linear feet at the inner end have been built by the United States Life-Saving Service to replace the ruined portion of the revetment, and of which 400 feet near the outer end were built by the Toledo & Ann Arbor Railroad Co. Dredging from time to time will be required to maintain the depths needed for navigation. The channel connects at the inner end with Lake Betsie (Aux Becs Scies), about 1½ miles long, 1,000 to 2,000 feet wide, and with generally shoal depths, except in the western portion where the depth is about 20 feet. The maximum draft that could be carried at the end of the fiscal year was about 18.5 feet (20 feet depth below zero of gauge).

Practically the entire commerce of this harbor is transacted by the car-ferry lines of the Ann Arbor Railroad, which has its northern terminus at this harbor. These car ferries run to Manitowoc, Kewaunee, and Marinette, Wis., and Manistique, Mich., upon the west shore of Lake Michigan, and form a highly important link in the through commerce between the Northwest and the Atlantic seaboard. The importance of maintaining adequate facilities at Frankfort Harbor is manifest. This can be done with certainty only by repeated dredging. Pier extension unaccompanied by thorough dredging will not serve.

The water-borne commerce at this port in 1911 amounted to 2,391 arrivals and departures, with 756,505 short tons of cargo, valued at $22,591,504, and for the most part general in character. The number of passengers carried in 1911 was 9,504.

The balance on hand is about $8,000, to be expended during the fiscal year ending June 30, 1913, and, in part, for the fiscal year ending June 30, 1914, for maintenance by dredging, repair of piers, and contingencies. For the fiscal year ending June 30, 1914, it is recommended that $3,000 be appropriated for maintenance by dredging, general repairs, and contingencies.

July 1, 1911, balance unexpended		$32, 315. 05
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$19, 626. 41	
For maintenance of improvement	2, 443. 77	
		22, 070. 18
July 1, 1912, balance unexpended		10, 244. 87
July 1, 1912, outstanding liabilities		1, 882. 85
July 1, 1912, balance available		8, 362. 02
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 3, 000. 00

(See Appendix L L 13.)

14. Charlevoix Harbor and entrance to Pine Lake, Mich.—This harbor is distant by water about 18 miles from the entrance to Grand Traverse Bay to the southwest, about 47 miles from South Manitou Harbor to the southwest, and about 17 miles from Petoskey Harbor a little north of east. In 1868, when the first estimate for improvement was made, the available channel in Pine River between Lake Michigan and Round Lake was 75 feet wide and 2 to 6 feet deep. Up to 1873 the local authorities, with some assistance from the State, had constructed 468 feet of cribwork in the north pier and 80 feet of cribwork in the south pier, and the available depth was 6 feet. The first appropriation by the United States was made in 1876, and actual operations upon the lower channel were begun in the fiscal year 1878; the first appropriation for the upper channel was made in 1882, and actual work begun in 1885. The total estimated cost was $186,000.

The original project, as proposed in 1868 and amended in 1876 and 1882, provided for a 12-foot channel from Lake Michigan to Round Lake (lower channel), between piers and revetments, 100 to 150 feet apart, and from Round Lake to Pine Lake (upper channel), between revetments, 83 feet apart. The following provision of the river and harbor act of June 13, 1902, may be said to have extended the scope of the original project: "Improving harbor at Charlevoix and entrance to Pine Lake, Michigan: Continuing improvement, twenty thousand dollars, to be first expended in obtaining a uniform depth of channel from Lake Michigan to Pine Lake." The controlling depth of the lower channel in June, 1902, was 16.3 feet below zero of gauge, or an actual depth at the then existing stage of 15.1 feet, so the project became one of a 15-foot navigation.

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[1] Exclusive of the balance unexpended July 1, 1912.

The amount expended under the existing project to June 30, 1912, was $210,532.45, of which $80,205.04 was for construction and $130,327.41 for maintenance.

The report upon a survey made with a view to obtaining a 16-foot channel is published in full in the Annual Report of the Chief of Engineers for 1897, pages 2953–2954, and is also printed with a map in House Document No. 144, Fifty-fourth Congress, second session.

Report of the examination authorized by the river and harbor act approved June 13, 1902, is published in the Annual Report of the Chief of Engineers for 1904, pages 3048–3055, and in House Document No. 222, Fifty-eighth Congress, second session.

Operations during the fiscal year were for maintenance. Soundings of May 20, 1912, showed the following available depths below zero of gauge: Lower channel, on entrance bar in Lake Michigan, 18 feet, and between the piers 16.3 feet; upper channel, 15.8 feet. Dredging by the *Meade* June 16–21, 1912, gave resulting depths below zero gauge of 19 feet and 17 feet in the lower and upper channels to provide the project depth of 15 feet actual water. By hired labor and purchased materials repairs were made June 19–24, 1912, to the south-pier walk from station 2+77 to 15+23 and to the deck from station 17+80 to 19+76.3 (the outer end of the pier).

The approved project has been completed with the exception of 200 lineal feet extension to the south pier, and this will be deferred for the present and depths on the entrance bar maintained by dredging alone. The maximum draft that could be carried at the end of the fiscal year was about 15.5 feet (17 feet depth below zero of gauge).

The principal traffic tributary to this harbor is lumber, iron ore, and pig iron, furnished by the industries at the head of Pine Lake, and passing through both channels. The present project depth of 15 feet does not provide the necessary depth for vessels carrying this class of freight. The river and harbor act of July 25, 1912, provides for a preliminary examination "with a view to an increased depth between Lake Michigan and Pine Lake," report on which will be transmitted to Congress as soon as received. Navigation extends to the head of Pine Lake, which is about 15 miles long and from 1 to 2 miles wide, with depths in the lower portion in excess of 60 feet; it extends southeasterly, with a least depth of 12 feet near Boyne City at the head of the bay. About 6 miles from its northwesterly end an arm of Pine Lake extends southerly 8 miles from the villages of East Jordan and South Arm, to which a draft of 12 feet can be carried. Charlevoix is also a much frequented summer resort, and during the summer season two steamboat lines makes regular and frequent calls at this harbor. There is, in addition, a small amount of local traffic.

The lake commerce through this port for 1911 amounted to 212,232 short tons of cargo, valued at $2,812,343, and was entirely local to Pine Lake. The total number of arrivals and departures was 1,237. The number of passengers carried in 1911 was 6,975.

The available balance from previous appropriations is about $14,500, which will be expended for maintenance by dredging and for repairs and contingencies, and is believed to be sufficient for this purpose to June 30, 1914; no further appropriation is therefore recommended at this time.

July 1, 1911, balance unexpended	$16,420.63
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	333.43
July 1, 1912, balance unexpended	16,087.20
July 1, 1912, outstanding liabilities	1,545.33
July 1, 1912, balance available	14,541.87
Amount (estimated) required to be appropriated for completion of existing project	[1] 23,750.00

(See Appendix L L 14.)

15. *Petoskey Harbor, Mich.*—This harbor is distant by water about 17 miles from Charlevoix Harbor in a direction a little south of west and about 4 miles from the harbor of Harbor Springs on the north shore of Little Traverse Bay. Before work at this harbor was begun by the United States its landing pier was exposed to winds coming from between west and northwest, and in high gales it was dangerous to attempt a landing.

A project was adopted in the river and harbor act of August 18, 1894, which provided for constructing a breakwater 600 feet long about 600 feet west of the outer end of the landing pier and another north of it 500 feet long, or as much longer as might be found necessary to cover the landing from all dangerous seas. Work was begun in 1896. Estimated cost was $170,000.

In 1902 the west breakwater had been built for a length of 400 feet and the north breakwater for a length of 200 feet. Investigation having shown that the north breakwater was too near the wharf and that the entrance between the two breakwaters was too narrow, the project was modified under authority conferred by the act of June 13, 1902, so as to provide for the removal of the north breakwater and the extension of the west breakwater, the final cost not to exceed the amount estimated to complete the original project, viz, $170,000.

The amount expended under the original project and as modified in 1902 up to June 30, 1912, has been $128,712.83, of which $118,239.40 was for new work and $10,473.43 for maintenance.

Reports are printed as follows: Preliminary examination report in the Annual Report of the Chief of Engineers for 1885, page 2095. Preliminary examination and survey in Annual Report of the Chief of Engineers for 1890, pages 2668–2675; also printed in House Executive Document No. 107, Fifty-first Congress, first session. Preliminary examination of September 21, 1911, is published in House Document No. 450, Sixty-second Congress, second session. A map of the locality is printed in the Annual Report of the Chief of Engineers for 1896 at page 2722.

Under maintenance operations for the fiscal year, the contract for repairs to the outer 220 lineal feet of the stone breakwater was completed July 20, 1911. It was found, August 30, 1911, that a settlement had taken place in the foundation stone under the outer end of the breakwater. This was repaired October 1–2, 1911, by placing riprap around the outer 200 feet of the breakwater; the work was done under written proposal of September 18, 1911. Repairs to the harbor side wall of the timber breakwater from station 1+17 S to 1+33 S were made July 20, 1911.

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[1] Exclusive of the balance unexpended July 1, 1912.

The breakwater as now existing has a total length of 1,345 feet, consisting of 445 feet of stonework at the shore end and 900 feet of cribwork. The amount expended for construction constitutes about 70 per cent of the estimated cost of the project. The breakwater ends in a depth of 31 feet below zero of gauge, at a distance of 1,290 feet from the shore line and 300 feet beyond the 30-foot curve, reaching an excessive depth as compared with any similar structure in this district and is ample for the needs of the harbor and satisfactory to the local interests using same. In the report on preliminary examination, published in House Document No. 450, Sixty-second Congress, second session, it is recommended that the $15,000 appropriated by the act of June 25, 1910, for the extension of the breakwater be reserved for maintenance and repair of the existing structures.

The latest soundings, made in June, 1911, the first since 1889, show available depths of 31 feet at the outer end of the breakwater and 16.7 feet to the outer end of the only commercial landing pier. This pier has been extended 103 feet, without authority, some time since 1895, date not known, leaving a clear width of only 490 feet to the breakwater, where there had formerly been 590 feet.

The lake commerce at this port in 1911 consisted of 380 arrivals and departures, with 3,200 short tons of cargo, valued at $560,000, entirely local in character. The total number of passengers carried was 1,935. Definite information as to the effect of the project on freight rates could not be obtained.

The available balance is about $16,800, which is believed to be sufficient for maintenance requirements to June 30, 1914.

July 1, 1911, balance unexpended	$19,728.55
Miscellaneous receipts	14.47
	19,743.02
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	2,941.38
July 1, 1912, balance unexpended	16,801.64
Amount (estimated) required to be appropriated for completion of existing projects	[1] 41,900.00

(See Appendix L L 15.)

16. U. S. dredge General G. G. Meade.—This dredge is of the seagoing suction type, and was built in 1904 for use at the harbors on the east shore of Lake Michigan, and has been in use since June 8, 1905.

Under extremely favorable conditions a maximum of slightly more than 4,000 cubic yards has been moved in a day of actual work, but the average at all harbors and under all circumstances is about 2,600 yards per day.

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[1] Exclusive of the balance unexpended July 1, 1912.

The great advantage of the *Meade* over a dipper dredge is the ability to work on the entrance bars in Lake Michigan, outside of the pier ends, in nearly all seasons, and the results obtained have been better entrance depths than had existed formerly. The final average cost of her work for the fiscal year is 12.23 cents per cubic yard, and this is believed to fairly represent the cost of dredging under the conditions existing in this district. When compared with the performance of similar machines on the seacoast, the cost may seem high; but the circumstances under which this dredge is obliged to work—such as insufficient depth of water, narrow and restricted channels, small areas on bars, etc.—affect unfavorably the final cost per unit.

A description of the boat is given in the Annual Report for 1910, page 2217, and a tabular statement of the results of operating the *Meade* during the fiscal year may be found in the Appendix of this report.

(See Appendix L L 16.)

17. Removing sunken vessels or craft obstructing or endangering navigation.—Wreck of schooner Margaret Dall at South Manitou Island.—Proposals for the removal of the wreck of the schooner *Margaret Dall*, in South Manitou Harbor, were received August 10, 1911, and the wreck was satisfactorily removed between September 6 and October 5, 1911.

Wreck of tug Payne in St. Joseph Harbor, Mich.—Authority was given and funds allotted June 14, 1912, for the removal of the wreck of the tug *Payne* in St. Joseph Harbor, and proposals for removal will be received early in July, 1912.

(See Appendix L L 17.)

EXAMINATIONS AND SURVEYS REQUIRED BY THE RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

The district officer also retained the duty of making a preliminary examination and survey of *Des Moines River, Iowa*, assigned to him while in charge of the Rock Island district. Under the provisions of river and harbor act approved March 3, 1909, a preliminary examination was made during the summer of 1909. A favorable report was submitted, and, on February 10, 1910, the Secretary of War authorized a survey. The survey has now been completed, and reports thereon will be transmitted to Congress at its next session.

EXAMINATIONS AND SURVEY MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and survey required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. Preliminary examination and survey of Manistee Harbor, Mich., with a view to securing a channel not less than 20 feet deep from Lake Michigan to Lake Manistee and the enlargement of the outer harbor, including the construction of a new south pier.—Reports dated December 23, 1910, and November 8, 1911, with map, are printed in House Document No. 599, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $456,000 for first construction, with $6,000 annually for maintenance, subject to the donation to the United States free of cost of a strip of land at the shore line at least 200 feet wide, as described in the said document, is presented.

2. Preliminary examination of Arcadia Harbor, Mich.—Report dated January 6, 1911, is printed in House Document No. 701, Sixty-second Congress, second session. The improvement by the United States of this harbor in the manner desired is not deemed advisable at the present time.

EXAMINATIONS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Reports on preliminary examinations required by the river and harbor act approved February 27, 1911, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. Preliminary examination of Petoskey Harbor, Mich.—Report dated September 21, 1911, is printed in House Document No. 450, Sixty-second Congress, second session. The further improvement of this harbor by the United States is not deemed advisable at this time, but it is recommended that the present project be modified, i. e., that the breakwater be not extended and that the funds appropriated by the act of 1910 be reserved for maintenance and repair.

2. Preliminary examination of St. Joseph Harbor, Mich., with a view to further improvement by removal of a shoal and the securing of increased depth and width of channel below Pere Marquette Railroad Bridge.—Report dated September 8, 1911, with map, is printed in House Document No. 629, Sixty-second Congress, second session. The improvement by the United States of this locality in the manner desired is not deemed advisable at the present time.

The local officer was also charged with the duty of making other preliminary examinations and surveys, provided for by the river and harbor acts of March 3, 1909, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. Grand Haven Harbor, Mich., to east end of Fulton Street and including channel into Spring Lake.

2. White Lake Harbor, Mich., from the mouth of the channel to White Lake.

3. Pentwater Harbor, Mich., from the mouth of the channel to Pentwater Lake.

IMPROVEMENT OF RIVERS AND HARBORS IN THE DETROIT, MICH., DISTRICT.

This district was in charge of Col. C. McD. Townsend, Corps of Engineers. Division engineer, Col. C. McD. Townsend, Corps of Engineers.

1. Ship channel connecting waters of the Great Lakes between Chicago, Duluth, and Buffalo.—This channel covers navigation through the chain of lakes known as Erie, St. Clair, Huron, Michigan, and Superior, and their connecting waters. In its original condition, the channel was obstructed by the rapids in St. Marys River, Mich., and by a number of shoal spots at various localities throughout its length, over which there were least depths varying from 6.5 to 17 feet at mean low water then prevailing. In 1855 the State of Michigan completed a canal at Sault Ste. Marie, with two tandem locks each 350 feet long, 70 feet in width, having 11½ feet of water on the miter sills, and a lift of 9 feet each. Prior to the Civil War the channels through Lake George in the St. Marys River and through the St. Clair Flats, at the outlet of St. Clair River, were deepened to 12 feet by the General Government.

When the construction of the Weitzel Lock was undertaken, providing for a navigable depth of 16 feet, it became necessary to increase channel depths not only at the localities above mentioned, but also at other localities on the St. Marys River and Detroit River. These improvements were made under specific appropriations for the localities where the work was required, as explained elsewhere in this report under the heads of St. Marys River, Hay Lake, St. Clair Flats, and Detroit River improvements.

When in 1890 the construction of the Poe Lock was undertaken, providing for a depth over the miter sill of 21 feet at mean lake levels, a deepening of the channel at other localities became necessary, and the construction of a channel with depths of 20 and 21 feet was authorized by Congress.

The work originally contemplated provided for improvements at eight localities, as follows:

(1) Round Island Shoals in upper St. Marys River, about 10 miles above Sault Ste. Marie, Mich., with a least depth of 17 feet and a length of 3,700 feet;

(2) Little Mud Lake, St. Marys River, about 18 miles below Sault Ste. Marie, Mich., with a minimum depth of 10 feet and a length of 4.5 miles;

(3) Sailors Encampment, St. Marys River, about 22 miles below Sault Ste. Marie, Mich., with a minimum depth of 6.5 feet and a length of 5,100 feet;

(4) Mud Lake, St. Marys River, about 24 miles below Sault Ste. Marie, Mich., with a least depth of 17 feet and length of 7,500 feet;

(5) Foot of Lake Huron, about 1,000 feet from Fort Gratiot Lighthouse, with least depth of 17 feet and length of 9,000 feet;

(6) Mouth of St. Clair River, Mich., having a minimum depth of 12 feet and length of 5.75 miles;

(7) Entrance to Detroit River in Lake St. Clair, where there was a shoal with least depth of 16 feet about 6 miles in length; and

(8) Mouth of Detroit River, where there was a bar about 4 miles below Bois Blanc Lighthouse about 2.5 miles in length with a least depth of 17 feet.

The existing project provides for the construction of a ship channel 20 and 21 feet in depth and a minimum width of 300 feet in the shallows of the connecting waters of the Great Lakes between Chicago, Duluth, and Buffalo. The estimated cost was $3,340,000 and the project was authorized by act of July 13, 1892. This project called for depths of 20 and 21 feet below mean low water which is assumed to have been at 601.5 for Lake Superior; 584.2 at foot of locks, St. Marys River; 581.1 for Lake Huron; 575.5 for Lake St. Clair; and 572.6 for Lake Erie.

The project was based upon a report of preliminary examination submitted in compliance with act of September 19, 1890, printed in House Executive Document No. 207, Fifty-first Congress, second session, and contained in the Annual Report of the Chief of Engineers for 1891, pages 2810–2820.

References to examination or survey reports and maps or plans not in project documents.

Congressional documents.				Annual reports of Chief of Engineers.	
House or Senate.	No.	Congress.	Session.	Year.	Page.
				1893 [1]	2962, 2964
				1894 [1]	2206
				1895 [1]	2806
				1896 [1]	2758
				1903 [1]	2002
				1904 [1]	3062
House [1]	266	Fifty-ninth	Second		

[1] Contains map.

No modification has been made in the existing project since its adoption. The scope of the work has, however, been extended to cover localities other than those originally contemplated where examinations disclosed isolated shoals, usually of small area. The principal additional works thus accomplished have been the widening of channel at Round Island shoals and the removal of the Vidal shoals in the upper St. Marys River, Squaw Island, and Sweet Point shoals at the mouth of the St. Marys River, Crab Island shoal in Detour Passage, the shoal in the St. Clair River at the mouth of the Black, the St. Clair Middle Ground shoal in the St. Clair River opposite the city of St. Clair, and Squirrel Island shoal in the same river. In addition, a new channel west of Stag Island, St. Clair River, has been opened by the removal of several shoals interfering with deep-draft navigation, and considerable work in Detroit River has been done that was not contemplated in the original project.

The operations during the past fiscal year have consisted in making survey of shoal at foot of Lake Huron and examination of the sections in Grosse Pointe channel, in Lake St. Clair and St. Clair River.

The total amount expended on existing project to the close of the fiscal year ending June 30, 1912, is $3,351,747.78, of which $11,747.78 have been expended for maintenance.

The project, which was slightly extended to cover the removal of additional small and occasional shoals as discovered from time to time, was completed in 1901, and a channel with 20 and 21 feet draft below the reference planes of its date (1892) was secured. In 1902, these datum planes were changed to 578.8 for Lakes Michigan-Huron, 573.8 for Lake St. Clair and 570.8 for Lake Erie, (all 1877 levels) and work was done at a number of localities to secure the additional depth this change called for. The maximum draft that can be carried June 30, 1912, over the shoalest parts of the channel, with reference to these adopted planes, is 19 feet. The monthly water levels may vary from 4 inches to 2 feet in a single year, and daily variations in the water surface may amount to 2 feet in variable weather, or even to 6 and 8 feet in severe storms on Lakes Superior and Erie.

The amount of freight carried through the St. Marys River section of the channel during the navigation season of 1911 was 53,477,216 short tons, valued at $595,019,844, exclusive of local traffic amounting to about 1,500,000 short tons. Statistics of traffic through the St. Clair Flats Canal indicate that 61,498,884 short tons of freight passed through this section, while that passing Detroit River amounted to 66,951,231 short tons, valued at $745,167,201.

It is believed that to attribute to the improvement in channels the difference in freight rates of 1900 (1.18 mills per mile-ton) and 1911 (0.67 mill per mile-ton) would not exaggerate the effect of the improvement, especially in view of the fact that the greater permissible draft has produced vessels of greater tonnage, the carrying capacity of freight steamers having increased from 8,000 tons in 1900 to 13,000 tons in 1907.

July 1, 1911, balance unexpended	$17,995.46
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	4,743.24
July 1, 1912, balance unexpended	13,252.22
July 1, 1912, outstanding liabilities	200.00
July 1, 1912, balance available	13,052.22

(See Appendix M M 1.)

2. *St. Marys River at the falls, Mich.*—The St. Marys River forms the outlet of Lake Superior, connecting it with Lake Huron. From Whitefish Bay, at Point Iroquois, the river flows in a general southeasterly direction to Lake Huron at Detour, a distance of from 63 to 75 miles, according to the route followed. The falls, or rapids, where the river falls about 20 feet in a distance of one mile, are located about 14 miles below Point Iroquois. The reach under improvement at the falls is about 2 miles long and from the lower end of the improvement to the outlet of the river at Detour is about 47 miles by way of the shortest navigation channel.

Commercial navigation of the falls, or rapids, of this river at Sault Ste. Marie was impracticable, except for logs and very small craft, until 1855, when the State of Michigan built a canal providing a navigable channel for vessels having a draft of 11.5 feet at mean stage of water, at a cost of about $1,000,000, the proceeds of 750,000 acres of land granted by the United States Congress. This improvement, completed in 1855, provided a canal 5,700 feet long with available width of 64 feet and top width of 100 feet, with a double lift lock having tandem chambers 350 feet long and 70 feet wide, with gate openings of 70 feet, and arranged for an average lift of about 9 feet at each lock.

In 1870 the United States entered upon a project for increasing the width of the canal to at least 100 feet, replacing the stone slope walls with timber revetment piers, building a new lock, and providing for 16 feet draft. This lock (now known as the Weitzel lock) was opened to traffic in 1881, its single chamber being 515 feet long and 80 feet wide, narrowed at gate openings to 60 feet and arranged for 18 feet average lift. The cost of the work from 1856 to 1885, inclusive, was $2,625,692, including $10,000 diverted from the 1864 Great Lakes appropriation. A rapidly increasing commerce developed as a result of these improvements.

The river and harbor act of August 5, 1886, authorized the execution of a project for building, on the site of the old State locks, a new lock with a single lift of 16 to 21 feet, the chamber being 800 feet long by 100 feet wide, with 21 feet depth on the miter sills at mean stage of water; also for deepening the canal and its approaches, all at an estimated cost of $4,738,865. The new lock, constructed under this project and known as the Poe Lock, was opened to navigation August 3, 1896. Later work consisted in completing the deepening of the canal and its approaches, rebuilding and extending canal piers, grading and improving canal grounds, etc.

The river and harbor act of June 13, 1902, authorized the following diversions from existing funds, namely, $20,000 for special improvement at Sailors Encampment, $20,000 for salaries and expenses of the International Waterways Commission, and $86,491.28, the amount required to complete certain improvements at St. Clair Flats Canal, for which existing funds pertaining to the latter work were insufficient. The act also provided for extending the work at the falls so as to include widening and further improvement of the canal above the locks, in accordance with the project submitted in House Document No. 128, Fifty-sixth Congress, second session, but made no additional appropriation therefor.

The river and harbor act of March 3, 1905, authorized the expenditure under continuing contract of $1,020,000, all of which has been appropriated, for widening canal as proposed in project submitted in House Document No. 215, Fifty-eighth Congress, third session.

The river and harbor act of March 2, 1907, adopted a project for the construction of a new lock, with a separate canal, in accordance with "plan 3," set forth in House Document No. 333, Fifty-ninth Congress, second session, at an estimated cost of $6,200,000. This project provides for a lock 1,350 feet long between gates, giving a usable length of not less than 1,300 feet, with least depth of 24.5 feet below extreme low water, and width of 80 feet, and a separate canal 260 to 300 feet in width. No modification has been made in the project for new lock and canal since its adoption in 1907.

The river and harbor act of July 25, 1912, adopted a project for the construction of a fourth lock, in accordance with the report submitted in House Document No. 64, Sixty-second Congress, first session, at an estimated cost of $3,275,000. This report provides for a lock of the same dimensions as the third lock, viz, length between gates, 1,350 feet; width, 80 feet; and depth, 24.5 feet at extreme low water. The lock is to be connected with the same canal as the third lock.

References to examination or survey reports and maps or plans not in project documents.

Congressional documents.				Annual reports of Chief of Engineers.	
House or Senate.	No.	Congress.	Session.	Year.	Page.
				1855 [1]	(?)
				1877 [2]	924
Senate	[3] 171	Forty-sixth	Second	1880 [3]	2071
				1880 [2]	2068
House	[2] 54	Forty-seventh	First	1882 [3]	2358
				1881 [2]	2267
House	[2] 128	Fifty-sixth	Second	1901 [3]	3200
Do	[2] 215	Fifty-eighth	Third	1905 [3]	2289
Do	[3] 333	Fifty-ninth	Second	1907 [3]	698
Do	[2] 266	do	do		
Do	[3] 716	Sixty-first	do	1910 [3]	860
Do	[3] 64	Sixty-second	First		

[1] Report of the Secretary of War, Jan. 18, 1855.

[2] Contains map.

[3] Without map.

During the fiscal year the widening of the present canal has been completed.

The amount expended on the general improvement for the fiscal year was $4,597.25. The total amount expended under the project of 1886, and its extensions and modifications to June 30, 1912, was $5,790,878.05, which amount includes $8,265.19 appropriated for settlement of claim, and the following amounts diverted as authorized by the river and harbor act of June 13, 1902: Applied to Sailors' Encampment, $20,000; for expenses of International Waterways Commission, $20,000 ($1,704.22 expended and $18,295.78 transferred); and for improvement of St. Clair Flats Canal, Mich., $86,491.28. The total amount expended for general improvement, including $2,625,692 expended on past finished projects, is $8,416,570.05. This amount includes $10,000 diverted from Great Lakes harbors appropriation of 1864.

The project of 1886 and its extensions and modifications, for general improvement, is practically completed, giving a canal 1⅗ miles long with width of 108 to 500 feet and depth of 24.6 feet in the upper portion, a movable dam, and a lock 100 feet wide and 800 feet long, with least depth of 17.7 feet below extreme low water surface 94.5 feet canal datum. The draft is restricted by the breast wall at the foot of the lock and the water level below the locks varies about 1 foot during the year.

In 1887 the freight passing the river was 5,494,649 short tons, valued at $79,031,757. In 1911 this traffic had grown to 53,477,216 short tons, valued at $595,019,844. The principal items of commerce are iron ore, coal, grain, and general merchandise. Average freight charges per ton mile have been reduced about 70 per cent since 1887. Details regarding the commerce of the canal are given in the report on operating and care of St. Marys Falls Canal, Mich.

The work of constructing the new lock and canal under the 1907 project has been in progress during the year. The excavation of the lock pit and the construction of sluice gates for controlling works in the new headrace for power plant were completed. Work on the west portion of canal and the new headrace was continued. Contracts have been let and some work done on other items of the project as follows: Excavating material and building revetment walls for second section of canal, between the railroad bridge and the lock, construction of the lock masonry, excavating the east approach and building the approach piers, building the lock gates, and furnishing steel, cement, timber, electric cables, etc., for the several portions of the work, the items being given in detail in the appended report of the district officer. The amount expended on new lock and canal project for the fiscal year was $598,842.28, and the total amount expended to June 30, 1912, was $1,328,441.56. Of the total estimated cost of the new lock and canal $4,225,000 has been appropriated and the balance, $1,975,000, authorized to be expended under continuing contract but not yet appropriated.

The amount estimated for profitable expenditure in the fiscal year ending June 30, 1914, will be applied to the construction of the third lock and canal in accordance with the project of 1907.

CANAL WIDENING, ETC.

July 1, 1911, balance unexpended	$5,849.39
June 30, 1912, amount expended during fiscal year, for works of improvement	4,597.25
July 1, 1912, balance unexpended	1,252.14

NEW (THIRD) LOCK AND CANAL.

July 1, 1911, balance unexpended	$1,995,400.72
June 30, 1912, amount expended during fiscal year, for works of improvement	[1] 598,842.28
July 1, 1912, balance unexpended	1,396,558.44
July 1, 1912, outstanding liabilities	134,115.00
July 1, 1912, balance available	1,262,443.44
Amount appropriated by sundry civil act approved Aug. 24, 1912	1,500,000.00
Amount available for fiscal year ending June 30, 1913	2,762,443.44
July 1, 1912, amount covered by uncompleted contracts	2,402,613.00
Amount of continuing contract authorization, act of Mar. 2, 1907	5,000,000.00
Amount appropriated under such authorization	3,025,000.00
Amount yet to be appropriated	1,975,000.00
Amount (estimated) required to be appropriated for completion of existing project	[2] 1,975,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[2] 1,475,000.00

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[1] Includes $58.05 paid by Treasury Department.

[2] Exclusive of amount available for fiscal year 1913.

NEW (FOURTH) LOCK.

Amount appropriated by river and harbor act approved July 25, 1912	$300,000.00
Amount available for fiscal year ending June 30, 1913	300,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1]2,975,000.00

CONSOLIDATED.

July 1, 1912, balance unexpended	$2,001,250.11
June 30, 1912, amount expended during fiscal year, for works of improvement	603,439.53
July 1, 1912, balance unexpended	1,397,810.58
July 1, 1912, outstanding liabilities	134,115.00
July 1, 1912, balance available	1,263,695.58
Amount appropriated by sundry civil act approved Aug. 24, 1912	1,500,000.00
Amount appropriated by river and harbor act approved July 25, 1912	300,000.00
Amount available for fiscal year ending June 30, 1913	3,063,695.58
July 1, 1912, amount covered by uncompleted contracts	2,402,613.00
Amount of continuing contract authorization, act of Mar. 2, 1907	5,000,000.00
Amount appropriated under such authorization	3,025,000.00
Amount yet to be appropriated	1,975,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1]4,950,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1]1,475,000.00

(See Appendix M M 2.)

3. Operating and care of St. Marys Falls Canal, Mich.—The former conditions and the results of the improvement are the same as above stated for St. Marys River at the falls.

The service of operating and care is provided for by the permanent indefinite appropriation for operating and care of canals and other works of navigation under the provisions of section 4 of the river and harbor act of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909.

The total expenditure on this account from 1881, when the Weitzel Lock was first put in service, to June 30, 1912 (excluding $9,866.85 outstanding liabilities), amounted to $2,112,654.49, of which $152,197.34 related to operations for the fiscal year.

During the fiscal year ending June 30, 1912, the United States canal was open to navigation 237 days, the closed season being from December 17, 1911, to April 23, 1912, inclusive. A total of 13,147 vessels, aggregating 25,328,832 registered tons, and carrying 26,237,785 short tons of freight and 37,723 passengers, passed through the locks in 8,855 lockages. The Canadian Canal at Sault Ste. Marie, Ontario, opened 234 days, made 5,492 lockages and passed 7,095 vessels, with an aggregate registered tonnage of 21,250,096, and carrying 32,696,509 short tons of freight and 39,879 passengers. The combined traffic through the two canals amounted to 58,934,294 short tons of freight and 77,602 passengers.

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[1] Exclusive of amount available for fiscal year 1913.

The principal items of freight during the past fiscal year through both canals were: Iron ore, 35,408,644 tons; coal, 15,063,899 tons; flour, 7,556,564 barrels; wheat, 122,393,553 bushels; other grain, 49,018,900 bushels; lumber, 577,887 thousand feet, board measure; and general merchandise, 1,370,639 tons.

Summary of St. Marys River commerce via American and Canadian Canals during the calendar season of 1911, from Apr. 22 to Dec. 16, 1911 (239 days).

Total freight carried	tons	53, 477, 216
Total tons net register		41, 653, 488
Total mile-tons		44, 173, 813, 460
Total valuation placed on freight carried		$595, 019, 844
Total amount paid for freight carried		$29, 492, 196
Total number of registered vessels using canals		765
Total number of passages by unregistered crafts carrying freight		421
Total valuation placed on registered vessels		$121, 547, 500
Total number of passengers transported		79, 951
Average distance freight was carried	miles	836
Average cost per ton for freight transportation		$0. 55
Average cost per mile per ton	mills	. 67
Average value per ton of freight carried		$11. 13
Time American Canal was operated	days	237
Time Canadian Canal was operated	do	236
Freight carried:		
Registered vessels	tons	53, 446, 620
Unregistered vessels	do	30, 596
American vesels	per cent	93
Canadian vessels	do	7
Passengers carried:		
American vessels	do	35
Canadian vessels	do	65
Average number of vessels passing per day:		
Poe Lock		34
Weitzel Lock		21
Canadian Lock		29
Poe, Weitzel, and Canadian Locks		78

Freight traffic by calendar years.

Year.	Short tons.	Year.	Short tons.	Year.	Short tons.
1881	1,561,741	1892	11,214,333	1903	34,674,437
1882	2,029,521	1893	10,796,572	1904	31,546,106
1883	2,267,105	1894	13,195,860	1905	44,270,680
1884	2,874,557	1895	15,062,580	1906	51,751,080
1885	3,256,628	1896	16,239,061	1907	58,217,214
1886	4,527,759	1897	18,982,755	1908	41,390,557
1887	5,494,649	1898	21,234,664	1909	57,895,149
1888	6,411,423	1899	25,255,810	1910	62,363,218
1889	7,516,022	1900	25,643,073	1911	53,477,216
1890	9,041,213	1901	28,403,065		
1891	8,888,759	1902	35,961,146		

For effect of channel improvement on freight rates see remarks under this head in report of ship channel connecting waters of the Great Lakes between Chicago, Duluth, and Buffalo.

(See Appendix M M 3.)

4. Hay Lake and Neebish Channels, St. Marys River, Mich.—The St. Marys River forms the outlet of Lake Superior, connecting it with Lake Huron. From Whitefish Bay, at Point Iroquois, the river flows in a general southeasterly direction to Lake Huron at Detour, a distance of from 63 to 75 miles, according to the route followed

The section included in this project extends from the locks and canal at Sault Ste. Marie by way of Hay Lake to Lake Huron, the mouth of the river. The original condition of this waterway included rapids and shoals characteristic of St. Marys River, and though passable for small craft having a draft of from 3 to 5 feet, the channel was not navigable in a commercial sense, and the route of vessels through the St. Marys River was by way of Lake George.

The original project, adopted by act of August 2, 1882, contemplated a channel 300 feet wide with least depth of 17 feet through all obstructed portions of the channel from the foot of the locks to Lake Huron by way of Hay Lake and the Middle Nebish. This project was modified by act approved August 5, 1886, to provide a depth of 20 feet and to widen at angles and critical places, at a total estimated cost of $2,659,115, all of which has been expended.

The river and harbor act of June 13, 1902, appropriated $500,000 and authorized work up to $4,000,000 more (all of which has been appropriated) for improving Middle and West Neebish Channels to provide for the commencement and prosecution of the project outlined in the preliminary report of June 4, 1900 (Annual Report of the Chief of Engineers for 1901, p. 3200), and the river and harbor act of March 3, 1905, appropriated $500,000 and authorized work up to $750,000 more, all of which has been appropriated, for improving Hay Lake and Neebish Channels for continuing this improvement.

The part of the project outlined in the above-named reports relative to the river below the canal, which has been covered by these two acts, is to provide a channel 1,500 feet wide from the Sault locks to the upper entrance to Hay Lake; to widen and deepen the upper entrance channel into Hay Lake so as to give a least width of 600 feet, with clear depth of 21 feet at low water; to excavate a new channel having least width of 300 feet and low-water depth of 21 feet between Hay Lake and Mud Lake, by way of the West Neebish; and to deepen the Middle Neebish Channel to give depth of 21 feet at low water, leaving its width unchanged. The effect of the execution of this project will be to provide a clear navigable depth of 21 feet from St. Marys Falls Canal to Lake Huron, the least width being 300 feet where two channels are provided, one for upbound and one for downbound boats, and 600 feet at all other places.

References to examination or survey reports and maps or plans not in project documents.

Congressional documents.				Annual reports of Chief of Engineers.	
House or Senate.	No.	Congress.	Session.	Year.	Page.
Senate	[1] 171	Forty-sixth	Second	1880 [1]	2071
House	[2] 54	Forty-seventh	First	1882 [1]	2358
				1884 [2]	2006
				1887 [2]	2240
				1888 [2]	1956
				1890 [2]	2716
				1891 [2]	2759
House	[2] 128	Fifty-sixth	Second	1901 [1]	3200
do	[2] 215	Fifty-eighth	Third	1905 [1]	2289
do	[2] 226	Fifty-ninth	Second		

[1] Without map.

[2] Contains map.

No modification has been made in the project of 1902 other than the extensions made by the act of 1905, as stated above.

During the fiscal year the work of deepening the Middle Neebish Channel at Sailors Encampment was continued, 1,250 cubic yards of earth and rock above grade having been removed, in addition to some half rate material, nearly completing this item of the project.

The total amount expended to June 30, 1912, on the Hay Lake and Neebish projects combined was $8,343,585.73.

The combined project for Hay Lake and Neebish Channels is practically completed, giving a navigable channel from the Sault locks to Detour with least width of 300 feet, where there are two channels, one for upbound and one for downbound vessels, and a least width of 600 feet at all other places, with a least depth of 21 feet at low water. The planes of reference vary from 580.6 at the foot of the locks to 579.0 at Lake Huron. The length of channel affected is about 47 miles, part of which is double and a portion of which was originally deep water requiring no improvement.

During the navigation season of 1911 the freight passing the river amounted to 53,477,216 short tons, valued at $595,019,844, and consisted mainly of iron ore, coal, grain, and general merchandise. The average freight charges per ton-mile have been reduced about one-third since the first opening of the Middle Neebish route in 1894. Details regarding the commerce passing St. Marys River are given in the report on Operating and Care of St. Marys Falls Canal, Mich. (Appendix M M 3.)

MIDDLE AND WEST NEEBISH CHANNELS.

July 1, 1911, balance unexpended	$48,350.88
June 30, 1912, amount expended during fiscal year, for works of improvement	12,526.66
July 1, 1912, balance unexpended	35,824.22
July 1, 1912, outstanding liabilities	825.00
July 1, 1912, balance available	34,999.22

HAY LAKE AND NEEBISH CHANNELS.

July 1, 1911, balance unexpended	$48,046.04
Refunded by Isthmian Canal Commission	66.77
	48,112.81
June 30, 1912, amount expended during fiscal year, for works of improvement	[1] 18,547.31
July 1, 1912, balance unexpended	[2] 29,565.50
July 1, 1912, outstanding liabilities	29,565.50

(See Appendix M M 4.)

5. *Mackinac Harbor, Mich.*—This harbor is situated on the southeast end of Mackinac Island, which is located in the Straits of Mackinac at the northern end of Lake Huron, at a distance of 15½ miles from the harbor of Cheboygan, on the mainland. The bay is semicircular, inclosing an area of about 34 acres, and opens toward the

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[1] Includes $161.85 expended for Isthmian Canal Commission. Deducting this amount leaves $18,385.46 net expenditures.

[2] Includes $66.77 refunded by Isthmian Canal Commission, but does not include $139.55 to be refunded.

southeast. While protected by Mackinac and Round Islands from northerly and southerly winds, it is exposed to quite heavy seas through the Straits of Mackinac when the wind has an easterly or westerly direction. At mean lake levels there is a depth of 18 feet in the harbor to its wharves.

The project for the improvement was adopted in the river and harbor act of June 25, 1910. It provides for two breakwaters extending from Mission and Biddle Points and having an aggregate length of about 2,000 feet, which are to be built of stone riprap and bowlders where it will cost less than cribwork. The estimated cost is $80,000. The project is based upon report of examination and survey contained in House Document No. 646, Fifty-sixth Congress, first session, which contains a map of the harbor, and is published on pages 4008–4012, Report of Chief of Engineers for 1900.

References to examination or survey reports and maps or plans not in project documents.

Congressional documents.				Annual reports of Chief of Engineers.	
House or Senate.	No.	Congress.	Session.	Year.	Page.
Senate	[1] 68	Forty-sixth	Second	1880 [1]	221 and 2055
House	[1] 71	Forty-eighth	do	1885 [1]	332 and 2180
				1887 [1]	294 and 2271

[1] No maps.

No modification has been made in the existing project since its adoption.

The work of building the substructure of the rubble mound extending from Mission Point was begun on May 5, 1911, and completed on July 22, 1911, a total of 17,349.9 tons of stone having been placed. On May 21, 1912, under a second contract, work was begun on the substructure of the breakwater extending from Biddle Point, and this work was still in progress at the close of the fiscal year, a total of 8,382 tons of stone having been placed in the superstructure.

The total expenditures to June 30, 1912, under present project are $21,592.49.

Congress by the river and harbor act approved February 27, 1911, authorized the completion of this work under the continuing-contract system, the total amount to be appropriated not to exceed $55,000, exclusive of the amounts heretofore appropriated, $35,000 of which is appropriated by the sundry civil act of August 24, 1912.

While the amount of freight received and shipped from Mackinac Island is small, there is a large passenger traffic during the summer months. Both the American and Canadian passenger vessels which run on through lines from the lower lakes to Lakes Michigan and Superior stop at this port, and there are special lines of vessels between it and Chicago, Milwaukee, Detroit, Cheboygan, Mackinaw City, St. Ignace, the Cheneaux Islands, and Sault Ste. Marie.

The commerce of the harbor consists of miscellaneous merchandise. It amounted to 12,297 short tons during 1911, valued at $1,844,550.

The amount estimated for the year 1914 will be applied to continuing construction of the breakwaters.

July 1, 1911, balance unexpended	$19,542.13
June 30, 1912, amount expended during fiscal year, for works of improvement	19,134.62
July 1, 1912, balance unexpended	407.51
July 1, 1912, outstanding liabilities	10,033.06
July 1, 1912, balance available (minus)	9,625.55
Amount appropriated by sundry civil act approved Aug. 24, 1912	35,000.00
Amount available for fiscal year ending June 30, 1913	25,374.45
July 1, 1912, amount covered by uncompleted contracts	22,462.61
Amount of continuing contract authorization, act of Feb. 27, 1911	55,000.00
Amount appropriated under such authorization	35,000.00
Amount yet to be appropriated	20,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 20,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 20,000.00

(See Appendix M M 5.)

6. Cheboygan Harbor, Mich.—This harbor includes the lower reach of the Cheboygan River and its outlet into the Straits of Mackinac, Lake Huron. The river has its source in Mullet Lake, from which it flows in a northerly direction, emptying into the Straits of Mackinac. The length of the river is 5½ miles. The project covers the river from deep water in the Straits of Mackinac to a lock and dam constructed under State authority, a distance of 11,720 feet, of which 6,000 feet are in the Straits. In 1870, when the original project for improvement was made, there was an available depth of 6 feet at plane 581.67. This project called for a channel 200 feet wide and 14 feet deep, its sides to be protected by pile revetment and piers, and the estimated cost of the work was $395,335.

Operations under this original project were confined solely to dredging, which was carried to a depth of only 13 feet until 1880, when the first of a series of projects which had for their object the obtaining of a 15-foot channel was submitted, and as a result of the work which was carried on under projects submitted in 1880, 1882, 1887, and 1888, a 15-foot channel was secured from the 15-foot contour in the Straits of Mackinac to the State Road Bridge, having a width of 200 feet from the Michigan Central Railroad dock out into the straits and a width within the river available between piers. A turning basin, with clear 15 feet depth, was also provided in front of the steamboat docks.

There was expended on the original project $90,874.42 and $57,055.02 on the modifications begun in 1880.

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[1] Exclusive of amount available for fiscal year 1913.

Entrance to the channel is marked by a lighthouse on a crib 40 feet square, which was built in 1881.

The present project was adopted by river and harbor act of June 3, 1896, and provides for dredging a channel 18 feet deep below the datum plane 581.67 for a width of 200 feet from the 18-foot contour in the Straits of Mackinac to the outer end of the west pier and inside of that point between lines parallel to and 25 feet from the piers to the State Road Bridge, estimated cost $80,000. Operations under this project were begun in 1895, and by 1903 the projected channel had been completed to within 900 feet of the upper limit of the harbor, which section still remains to be dredged to complete the project.

As stated in report of district officer, it is believed that the completion of the 18-foot channel for the above 900 feet is warranted by existing conditions.

The datum plane for work under this project, which has heretofore been 581.67, is from 1 to 2 feet higher than the mean surface elevation of Lake Huron during the past two years and has been changed to 579 in order to provide the channel depths called for by the adopted project.

The river and harbor act approved March 2, 1907, directed the extension of the improvement from the State Road Bridge to the lock in the Cheboygan River by a channel 8 feet deep and 60 feet wide, the estimated cost of which was $10,797.60.

Work on this extension was begun in October, 1907, and completed in August, 1908.

This extension of the project is based upon report of examination and survey contained in House Document No. 537, Fifty-ninth Congress, first session (no map), reference to which is made on page 664, Report of the Chief of Engineers for 1900.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
In Straits of Mackinac					1871 [1]	183-186
Straits of Mackinac to State Road Bridge.					1896 [2]	2825
Do	House	[2] 636	Fifty-sixth	First	1900 [1]	4012-4014

[1] No map.

[2] Contain map.

The existing project, as modified by act of March 2, 1907, contemplates a channel 18 feet deep with a width of 200 feet from the 18-foot contour in the Straits of Mackinac to the outer end of west pier and between lines parallel to and 25 feet from the docks from that point to the State Road Bridge, and a channel 8 feet deep and 60 feet wide from the bridge to the lock in the Cheboygan River.

No work has been done during the past year.

The amount expended on the work of the existing project up to the close of the fiscal year ending June 30, 1912, is $41,381.25, none of which has been applied to maintenance. It is proposed to expend the funds on hand in restoring channel depths wherever necessary.

The maximum draft that can be carried over the shoalest part of the channel is 16 feet to a point within 900 feet from the State Road Bridge, 8 feet from that point to the bridge, and 7 feet from the bridge to the lock.

Above the lock the river is navigable through what is known as the "Inland Route," through Mullet Lake, Indian River, Burt Lake, Crooked River and Lake, a distance of 36 miles, for boats having a draft of from 4 to 5 feet.

The commerce of the harbor consists mainly of logs, lumber, farm products, pulp wood, and ties. It amounted to 334,551 short tons during 1911, and was valued at $2,714,856. A number of large lake passenger steamers stop at this port during the summer months.

On account of the progressive nature of the improvement, the effect upon freight rates has been gradual, and the precise effect is therefore difficult of ascertainment, but there can be no doubt that during the season of navigation the existence of the deep-water harbor at Cheboygan has had a very decided effect on freight rates.

The funds estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to the completion of the 18-foot portion of the project up to the State Road Bridge, in order to make the improvement available for vessels trading to docks and dry dock in this section of the river.

July 1, 1911, balance unexpended	$9,189.31
July 1, 1912, balance unexpended	9,189.31
Amount (estimated) required to be appropriated for completion of existing project	[1] 14,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 14,000.00

(See Appendix M M 6.)

7. *Rogers City Harbor, Mich.*—Rogers City is situated on the shore of Lake Huron, about 40 miles distant from Cheboygan by water. Approach to the docks which extend into the lake from the shore was obstructed by a bar composed of sand, gravel, and bowlders having a channel depth over it of 12½ feet at 581.1 above mean tide at New York.

The existing project, adopted by the river and harbor act approved June 25, 1910, provides for dredging a channel through this bar 200 feet wide and 16 feet deep at the mean stage of Lake Huron (581.1), at an estimated cost of $6,000.

The project is based on report of examination and survey contained in Rivers and Harbors Committee Document No. 28, Sixty-first Congress, second session. No modification has been made in the existing project since its adoption.

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[1] Exclusive of the balance unexpended July 1, 1912.

References to examination or survey reports and maps or plans not in project documents.

Congressional documents.				Annual reports of Chief of Engineers.	
House or Senate.	No.	Congress.	Session.	Year.	Page.
House	[1] 162	Fifty-ninth	First	1906 [1]	664
Do	[1] 352	Sixty-first	Second	1910 [1]	860

[1] No maps.

The river and harbor act of June 25, 1910, appropriated $6,000 for the work, and this sum was expended during the summer of 1911 in securing a channel 16 feet deep and 130 feet wide through the bar. This channel is believed to be ample for vessels trading to this port, and it is not considered necessary to complete the channel to the full project width.

The expenditures to June 30, 1912, were $5,666.34, none of which has been applied to maintenance.

The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality is 16 feet at 581.1.

No statement of commerce for year 1911 has been received.

July 1, 1911, balance unexpended	$5,963.62
June 30, 1912, amount expended during fiscal year, for works of improvement	5,629.96
July 1, 1912, balance unexpended	333.66

(See Appendix M M 7.)

8. *Alpena Harbor* (*Thunder Bay River*), *Mich.*—This harbor is located on the northwest shore of Thunder Bay, Lake Huron, and comprises the lower reach of Thunder Bay River and its junction with the bay. The original depth of water over the bar at the mouth of the river was only 7 feet at 581.5. The Thunder Bay River is formed by the confluence of a number of small streams in Montmorency and Alpena Counties, Mich., flows in an easterly direction, and empties into Thunder Bay. The river is about 45 miles long. The length of the section included in the project is 4,050 feet, and the distance of the outer end of the improved channel from the mouth of the river is 2,500 feet. Local enterprise had secured a narrow channel 12 feet deep through the bar before work was undertaken by the Government in 1877, when, under the original project for the improvement of this harbor, act of August 14, 1876, a channel 13 feet deep and 200 feet wide was secured at a cost of $4,390.48. Shoaling having occurred, in 1882 $15,000 was appropriated for redredging the channel, and the project was modified so as to provide for an available depth of 14 feet. The work was completed the following year at a cost of $10,500, and $3,998.22 was expended in 1889 in redredging to 14 feet across the bar and 13 feet upstream. The amount expended on this project was $14,498.22.

By act of September 19, 1890, the present project was adopted so as to provide for a channel depth of 16 feet below the datum plane 581.5 and the extension of the improvement up the river about a mile to the vicinity of the dam across the river at that point, with widths varying as follows: Two hundred feet at the 16-foot contour in Thunder Bay, thence tapering to 100 feet at the lighthouse crib, thence 100 feet to the Second Street Drawbridge, thence 75 feet to the Minor Lumber Co.'s wharf, thence 50 feet to the upstream limit of the channel improvement, the estimated cost being $36,087.48.

The datum plane for work under this project, which has heretofore been 581.5, is from 1 to 2 feet higher than the mean surface elevation of Lake Huron during the past two years, has been changed to 579.0, in order to provide the channel depths called for by the adopted project.

The project is based upon reports of examination and survey submitted December 15, 1888, and April 17, 1889, which are published in the report of the Chief of Engineers for 1889, pages 2288-2290. This report contains a map of the river.

No modification has been made in the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Pier construction at mouth [1]					1871	158-159
First bridge to mouth of river [1]	House	121	Forty-fourth	First	1876	548 (Vol. II)

[1] No map.

No work has been in progress during the past year, the expenditures having been applied to payment of office and contingent expenses.

The amount expended on the work of the existing project to the close of the fiscal year ending June 30, 1912, is $36,643.92, of which amount $15,343.45 has been applied to maintenance.

The total length of dredged channel is 6,550 feet, a channel 2,500 feet long and 100 to 200 feet wide having been secured in Thunder Bay, and 4,050 feet long in the river, with widths varying from 100 feet at the lighthouse crib to 50 feet at the upstream limit of the improved channel. The maximum draft that can be carried over the shoalest part of the channel June 30, 1912, is 13.5 feet. The river is navigable to the upper limit of the improvement only, farther navigation being interrupted by the dam across the river at that point.

The piers at Alpena have been constructed of slabs and have heretofore been held in position by heavy piles of lumber. The timber of this section of the country is rapidly being cut away, and the lumber stored is diminishing. As the lumber piles are removed it will be necessary to add sufficient riprap to the outer ends of the slab piers to prevent their destruction by wave action in Thunder Bay.

The commerce of the harbor consists mainly of lumber, cement, stone, coal, cedar posts and ties, and miscellaneous merchandise. It amounted to 804,440 short tons during 1911, valued at $5,912,630.

The effect of the improvement upon freight rates has been very beneficial, as it is estimated that freight and passenger rates have decreased almost one-half since the improvements were made.

July 1, 1911, balance unexpended	$15,020.18
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	52.80
July 1, 1912, balance unexpended	14,967.38
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

(See Appendix M M 8.)

Saginaw River, Mich.—This river is formed by the junction of the Tittabawassee and Shiawassee Rivers, at the southerly limits of the city of Saginaw, flows in a northerly direction a distance of 22 miles, and discharges into the south end of Saginaw Bay. The project covers the entire length of the river and 4¾ miles in the bay. Prior to improvement the entrance to the river was obstructed by a bar in Saginaw Bay, having a minimum depth of about 9 feet at 581.63. Between the mouth and Bay City the depth varied from 15 to 30 feet. Thence to the head of the river the channel was obstructed by a number of bars having 7 feet of water.

The orginal project for the improvement of this river was made in 1866, and contemplated a straight channel 195 feet wide and 12 feet deep across the bar at the mouth. This was completed in 1869. In 1874 the project was extended to include the improvement of the river above Bay City. It included dredging a 10-foot channel across the bars at East Saginaw and Carrollton and the construction of a pile revetment at the latter place. Later similar improvements at Zilwaukee bar, New York Works bar, and Willow Island were added. The cost of the work under this project was $219,000.

In 1882 a project was adopted which provided for a channel 200 feet wide and 14 feet deep from Saginaw Bay to and along the front of Bay City, and thence a channel of same width, 12 feet deep, to the upper limits of the city of Saginaw, the datum plane being 581.1; estimated cost $546,000. By the river and harbor act of August 5, 1886, the improvement of the west channel along West Bay City was also added to the project.

The amount expended on project of 1882 to June 30, 1910, is $743,558.10. In the past no attempt has been made to separate the cost of maintenance from that of original improvement, so that it is impossible now to separate these items.

The existing project, adopted by the river and harbor act of June 25, 1910, provides for a channel 200 feet wide with a depth of 18 feet from Saginaw Bay to the mouth of the river and of 16 feet, at 581.1, from that point to the junction with the Tittabawassee River; estimated cost $686,000, with $20,000 annually for maintenance.

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[1] Exclusive of balance unexpended July 1, 1912.

The datum plane for work under this project, which has been heretofore 581.1, is from 1 to 2 feet higher than the mean surface elevation of Lake Huron during the past two years, has been changed to 579.0, in order to provide the channel depths called for by the adopted project.

This project is based upon report of examination and survey published in House Document No. 740, Sixty-first Congress, second session, and referred to on page 861, Report of Chief of Engineers for 1910. This report contains a map of the river.

No modification has been made in the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
					1866 [1]	[illegible]
Bay section					1872 [1]	[illegible]
Saginaw, 7½ miles down river					1874 [1]	[illegible]
Bay section					1875 [1]	[illegible]
Do	House	[1] 121	Forty-fourth	First	1876 [1]	54[illegible] (Vol. II
Carrolton Bar					1878 [1]	[illegible]
Upper River					1881 [1]	[illegible]
Saginaw, Shiawassee, Bad, and Flint Rivers.	House	[2] 185	Fifty-fifth	Second	1898 [1]	2600-[illegible]
Tittabawassee River	do	[1] 186	Fifty-third	Third	1895 [1]	2848-[illegible]
Shiawassee, Bad, and Flint Rivers	do	[1] 222	do	do	1895 [1]	2852-[illegible]
Saginaw River	Senate	[1] 218	Fifty-fifth	Second	1898 [1]	[illegible]
Saginaw-Melbourn					1879 [2]	[illegible]
Saginaw River					1884 [2]	[illegible]
Do					1886 [2]	[illegible]

[1] No map.

[2] Contains map.

The operations which were in progress at the close of the last fiscal year were continued during the past year, and 765,523 cubic yards were removed.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, is $99,978.81, all of which has been applied to improvement.

The work is being prosecuted under the continuing contract system. Of the total amount authorized ($636,000) $236,000 remains to be appropriated.

At the close of the fiscal year 27½ per cent of the project has been completed. So far there are no results in the way of increased depth, as neither the bay nor the river section of the work has been completed. The maximum draft that can be carried June 30, 1912, over the shoalest part of the channel is 12.4 feet to Bay City and 8.9 feet to Saginaw at 579. The entire river is navigable.

The value of the commerce carried in 1911 is $2,342,254, and it consisted mostly of lumber, logs, cement, lath, and miscellaneous merchandise, and amounted to 236,636 short tons.

The precise effect of the improvement upon freight rates can not be stated. It is undoubted, however, that freight rates, both to Bay City and Saginaw, have been materially lowered by the existence of the improved channel.

The available balance and the additional funds requested will be expended for deepening the channel in the bay to the mouth to 18 feet, from the mouth to the junction of the Tittabawassee River to 16 feet, and the necessary inspection and engineering.

July 1, 1911, balance unexpended	$345,778.56
June 30, 1912, amount expended during fisca leyar, for works of improvement	90,558.63
July 1, 1912, balance unexpended	255,214.93
July 1, 1912, outstanding liabilities	35,023.95
July 1, 1912, balance available	220,190.98
Amount appropriated by sundry civil act approved Aug. 24, 1912	100,000.00
Amount available for fiscal year ending June 30, 1913	320,190.98
July 1, 1912, amount covered by uncompleted contracts	369,322.41
Amount of continuing-contract authorization, act of June 25, 1910	636,000.00
Amount appropriated under such authorization	400,000.00
Amount yet to be appropriated	236,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] [2]236,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[2]236,000.00

(See Appendix M M 9.)

10. Sebewaing River, Mich.—The Sebewaing River is a small stream about 6 miles long, which flows into the eastern part of Saginaw Bay about 20 miles from the mouth of the Saginaw River. The length of that part of the river included in the project is 1,200 feet, and the distance from the mouth of the river to the outer end of the improvement in Saginaw Bay is 15,000 feet. The original channel from Saginaw Bay to the mouth of the Sebewaing River had an available depth of scant 4 feet. The first improvement was made in 1875, under the original project of that year, when a narrow channel 6 feet deep was dredged from the 6-foot curve in Saginaw Bay to the mouth of the river, and some dredging was also done within the river itself, by which it was straightened and deepened to 6 feet, at a cost of $8,000.

The project was modified in 1880 and $7,000 appropriated for deepening the channel to 7 feet, the work being done in 1880–81.

The existing project, adopted by river and harbor act of June 3, 1896, provides for dredging the entrance channel to a width of 100 feet and depth of 8 feet below the datum plane of the survey of 1895, at 580, the length of dredged channel to be about 15,000 feet, estimated cost $37,000.

The project is based upon report of examination and survey contained in House Document No. 71, Fifty-fourth Congress, first session, with map, and published in the Report of the Chief of Engineers for 1896, page 2743.

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[1] This is the unappropriated balance of the original estimate. On account of the lowering of the datum plane on which this estimate was based and the consequent increase in work to be done, this amount will not complete the project.

[2] Exclusive of amount available for fiscal year 1913.

No modification has been made in the existing project since its adoption.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Bay section					1873 [1]	206, [illegible]
Do					1875 [1]	[illegible]
River and bay	Senate	[1] 164	Forty-sixth	Second	1880 [1]	2044
Do					1884 [1]	208, [illegible]
River	House	[1] 154	Fifty-first	Second	1891 [1]	2804–[illegible]
River and bay	do	[1] 237	Fifty-second	do	1896 [1]	2951–[illegible]
Do					1908 [2]	[illegible]

[1] No map.

[2] Contains map.

No work has been in progress during the past year. The funds expended were applied to office expenses.

The amount expended on the work of existing project to the close of the fiscal year ending June 30, 1912, is $44,000, of which amount $8,426.55 has been applied to maintenance.

The work done at this locality resulted in securing a channel of the required depth and length, but with widths varying from 70 to 90 feet. The maximum draft that can be carried June 30, 1912, is 3 feet at 581.1. The river is navigable to the docks at Sebewaing.

A statement of commerce for past year has not been obtained.

The effect of the project upon freight rates can not be definitely stated, but is considered insignificant.

For reasons stated in his report, the district officer does not consider this stream worthy of further improvement.

July 1, 1911, balance unexpended	$7.33
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	7.33

(See Appendix M M 10.)

11. Harbor of refuge at Harbor Beach, Lake Huron, Mich.—The site for this harbor, selected in 1872 by a board of Engineer officers, is on the west shore of Lake Huron, 60 miles north of its outlet into the St. Clair River, and the artificial harbor built there since then is the only safe refuge on that coast from the foot of the lake to Tawas Bay, 115 miles above.

The work of construction was authorized by act of March 3, 1871, and commenced in 1873 under the existing project, which provides for three separate piers, or breakwaters, of cribwork filled with stone, so located as to shelter a water area of some 650 acres on the north, northwest, and west sides, and for deepening this area by dredging where necessary. The estimated cost of the breakwaters was $1,452,550.

The project was based upon the report of a board of Engineer officers, which is published on pages 209-213, Report of the Chief of Engineers for 1872, and pages 292-295 of the report for 1873.

References to examination or survey reports and maps or plans not in project documents.

Congressional documents.				Annual reports of Chief of Engineers.	
House or Senate.	No.	Congress.	Session.	Year.	Page.
				1871 [1]	44
				1872 [1]	209-213
				1872 [1]	217-222
				1873 [1]	292-295
				1877 [2]	980
				1879 [2]	1646
				1882 [2]	2372
				1884 [2]	2048
				1885 [2]	2156
				1886 [2]	1830
House	[2] 900	Fifty-ninth	First	1906 [1]	664

[1] No maps.

[2] Contains maps.

There has been no modification in the existing project since its adoption.

The work which has been in progress during the past year has consisted in controlling and berthing vessels entering the harbor, and the completion of the work of rebuilding the superstructures of the north pier and of the pierhead of the south pier.

Work on the main pier was completed in September, 1908. The work of rebuilding in concrete the superstructures of the north pier and of the pierhead of the south pier was begun in May, 1911, and was completed October 10, 1911.

The total amount expended to the close of the fiscal year ending June 30, 1912, is $1,999,278.15, of which about $975,000 was applied to the first cost of the sheltering breakwaters, which were completed in 1885. Since that time there has been applied to maintenance $1,024,278.15, which includes the construction of concrete superstructures, the keeping of the wooden piers in repair, dredging within the harbor, control and berthing of vessels entering the harbor for shelter, and engineering supervision and general office expenses.

The breakwaters forming the harbor were completed in 1885 at a cost of $970,716.40, including maintenance to that date.

As a result of the expenditures made upon this harbor, there has been created an artificial harbor of refuge, which has been used for shelter during the past year by 660 vessels, with a total short tonnage of 571,864. The grand total of vessels that have found shelter from 1877 to 1911, inclusive, is 39,844, the tonnage of which aggregated 18,640,080 short tons. The vessels sheltered in 1877 averaged 289 tons each, and those during the year 1911, 850 tons. The maximum draft that can be carried into the harbor through the main entrance, making allowance for the effect of moderate seas, is between 19 and 20 feet, and vessels having this draft may safely lie inside the main pier.

The amount estimated as a profitable expenditure in the fiscal year June 30, 1914, will be applied to maintenance of the harbor.

July 1, 1911, balance unexpended	$99,364.89
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	72,275.83
July 1, 1912, balance unexpended	27,089.06
July 1, 1912, outstanding liabilities	3,000.00
July 1, 1912, balance available	24,089.06
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 89,000.00

(See Appendix M M 11.)

12. Mouth of Black River, Rouge River, and Monroe Harbor, Mich.—(*a*) *Mouth of Black River.*—An extensive bar and shoal existed in the St. Clair River adjoining the mouth of the Black. The bar lay close to the American side and formerly obstructed the approach to the Port Huron docks, while the shoal, forming a "middle ground" nearly 50 acres in extent, crowded the main channel in a sharp curve close to the Canadian shore.

The project submitted in 1871 contemplated the removal of this bar and the middle ground to a depth of 15 feet, at an estimated cost of $67,320. The work was begun in 1872 and completed in 1878, at a cost of $56,500.

The present project, adopted by act of August 11, 1888, contemplates dredging to a uniform depth of 16 feet along the dock front of Port Huron from the 16-foot curve above to the same curve below the mouth of the river, the plane of reference being 579.6. Estimated cost, $69,300.

The project is based upon a report of examination and survey contained in Report of the Chief of Engineers for 1887, pages 2279-2280.

References to examination or survey reports and maps or plans not in project documents.

Congressional documents.				Annual reports of Chief of Engineers.	
House or Senate.	No.	Congress.	Session.	Year.	Page.
				1871 [1]	177-180
				1877 [2]	984

[1] No maps.

[2] Contains maps.

No modification has been made in the existing project since its adoption.

No work was in progress during the past year.

The total amount expended on the existing project to the close of the fiscal year ending June 30, 1912, is $29,348.58, of which $12,008.31 has been applied to maintenance.

The work on the project was begun in May, 1889, and completed in 1892, when authority was received to deepen the outer border of the shoal adjacent to the main channel to 18 feet, and this work was done. Operations since that time have been confined to maintenance.

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[1] Exclusive of the balance unexpended July 1, 1912.

As a result of the work heretofore done, through navigation for vessels of moderate draft has been facilitated and entrance into the Black River proper has been rendered possible for this class of vessels. This, it is believed, has resulted in a reduction of freight rates, the extent of which could not be ascertained. For reasons stated in his report, the district officer considers that work at this locality should be suspended.

July 1, 1911, balance unexpended	$2,643.11
July 1, 1912, balance unexpended	2,643.11

(*b*) *Rouge River.*—The Rouge River rises in the northwestern part of Wayne County, flows in an easterly direction, and empties into the Detroit River at the southerly limits of the city of Detroit. The river is about 30 miles in length. The particular section included in the project is 4½ miles long. This stream originally had a channel depth of from 10 to 17 feet at 575 from its mouth to where the Wabash Railroad bridge crosses it, a distance of about 3 miles.

Under the provisions of the river and harbor act of August 5, 1886, a survey of the river was made and a project dated August 25, 1888, prepared for securing a channel depth of 16 feet with a width of 240 feet at the mouth, tapering to 100 feet at a distance of 800 feet from the mouth, and thence with a width of 100 feet to the Wabash Railroad bridge, the plane of reference being 575. The estimated cost was $31,690.39. The work of improvement was commenced in 1888 and completed in November, 1892, at a cost of $30,272.79.

By a joint resolution approved April 11, 1898, Congress authorized an extension of the improvement, with depth of 13 feet, up to the Maples Road, a distance of about 1½ miles above the Wabash Railroad bridge, limiting the expenditure to $5,000. The river was dredged in 1900, the channel being made 50 feet wide.

The project for this river was modified by act of March 2, 1907, so as to provide an increase in depth from 16 feet to 21 feet between the mouth of the river and the first bridge, a distance of about 1,400 feet; estimated cost, $3,575.

The project is based upon reports of examinations and surveys contained on pages 2275–2278 (with map) of the Annual Report of the Chief of Engineers for 1887, in House Document No. 138, Fifty-fifth Congress, second session (with map), and printed in Report of Chief of Engineers for 1898, pages 2605–2607, and in House Document No. 289, Fifty-ninth Congress, first session (with map), referred to in Report of Chief of Engineers for 1906, page 664.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page
Turning basin	House	115	Fifty-first	Second	1891 [1]	2822–2823

[1] No map.

The existing project provides for dredging a channel 21 feet deep from the mouth of the river to the first bridge, with a width of 240 feet at the mouth tapering to 100 feet at a distance of 800 feet from the mouth, a channel 16 feet deep and 100 feet wide from the first bridge to the Wabash Railroad bridge and a channel 18 feet deep (width not specified) thence to the Maples Road.

The datum plane for work under this project, which has heretofore been 575, is from 1 to 2 feet higher than the mean surface elevation of Lake Huron during the past two years, has been changed to 572.5, in order to provide the channel depths called for by the adopted project.

No work was in progress during the past year. The river and harbor act of June 25, 1910, provided that no part of the sum appropriated therein ($20,000) should be expended at those points within the limits of the project where shoaling is due to caving banks until the banks shall have been protected by suitable docks or revetments, constructed at the expense of the riparian interests. The river and harbor act of February 27, 1911, made an appropriation of $5,000 for maintenance, subject to the conditions imposed by the act of 1910. These conditions having been complied with where necessary, it was decided to expend available funds in restoring the channel where shoaling had occurred, and the bids for this work were opened June 28, 1912.

The amount expended on the work of the existing project to the close of the fiscal year ending June 30, 1912, is $76,352.67, of which $26,270.18 has been applied to maintenance.

The approved project has been completed, affording the depths and widths called for. The maximum draft that can be carried June 30, 1912, from the mouth to the Solvay Tunnel is 17 feet, from there to the Wabash Railroad bridge 13 feet, and 10 feet to Maples Road, at datum plane 575. The river is navigable for vessels of light draft to the town of Dearborn, 15 miles above the mouth.

The receipts and shipments by vessel during the year 1911 amounted to 951,309 short tons, of which 248,303 short tons were iron ore, 80,165 short tons lumber, 110,282 short tons oil, and 409,766 short tons gravel and sand. The value of this commerce is about $3,216,515.

As a result of the improvement the area available for manufacturing plants in the vicinity of Detroit has been greatly extended, and these plants have been enabled to receive the raw materials which they use without transfer or transshipment. As a consequence, the cost of the raw materials has been greatly reduced.

The effect of the improvement has been to reduce freight rates 30 to 50 per cent for firms actually using dockage on the river.

The amount estimated for the fiscal year 1914 will be applied to maintenance of channel.

July 1, 1911, balance unexpended	$25,337.33
July 1, 1912, balance unexpended	25,337.33
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000.00

(*c*) *Monroe Harbor.*—The harbor of Monroe, Mich., is within the mouth of Raisin River, at the western extremity of Lake Erie. In its natural condition the river flowed into the lake through several ponds and winding creeks. The depth of water at the deepest mouth of the river in its natural condition did not exceed 5 feet. This river has its source in the western part of Lenawee County, flows in an easterly direction, and empties into Lake Erie about 18 miles from the city of Toledo, Ohio. The river is about 70 miles long, of which 13,000 feet are included in the project. The distance from the mouth of the river to the outer end of the improvement is 2,500 feet.

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[1] Exclusive of the balance unexpended July 1, 1912.

The original project for the improvement of Monroe Harbor was adopted by act of February 24, 1835. It had for its object to dredge a new and direct channel 100 feet wide and 10 feet deep from the lake across the marsh, a distance of 4,000 feet, to the portion of the river ordinarily used as a harbor, the protection of the entrance into the lake by piers 726 feet long and 20 feet wide, extending outward to a depth of 10 feet in the lake, and the protection of the sides of the canal by a revetment. The estimated cost of the work, exclusive of dredging machine, was $55,885. The work was practically completed in 1845, a depth of 9 feet being obtained to a point just below the docks at Monroe. Subsequently the city of Monroe further improved the river channel by cutting a canal about 1,300 feet long, 100 feet wide, and with a depth of from 13 to 16 feet, across a bend of the river. The act of March 3, 1871, directed a resurvey of the harbor. This survey was made and a plan submitted for obtaining a depth of 11 feet up to the docks at Monroe. Estimated cost, $12,600. The channel was dredged in 1872.

The project is based upon report of examination and survey made in 1834, which is not published but is referred to on page 2087 of the Report of the Chief of Engineers for 1880, and upon report of survey made in 1871, published on pages 237–239 of the Report of the Chief of Engineers for 1872.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
					1866 [1]	29
Lake and river					1889 [2]	2338–2340
Do					1891 [1]	2627
Do					1897 [2]	3037–3040
Raisin River	House	[2] 81	Fifty-fourth	Second	1897 [2]	3094–3096
Lake and river	do	[2] 102	Fifty-fifth	do	1898 [1]	2690–2696

[1] Contains map.

[2] No map.

The project provides for dredging a channel 11 feet deep and 100 feet wide from the lake to the city docks and for protecting the entrance into the lake by piers.

During the past year no work has been in progress at this harbor.

The total amount expended on this work up to the close of the fiscal year ending June 30, 1912, is $261,345.61, of which $110,000 was applied under the original project. It is impossible to separate the portion of this total which has been applied to maintenance. During recent years practically all expenditures have been made for that purpose.

The channel, beginning at the outer end, consists of the United States canal, 4,000 feet long, with an available depth of about 11 feet. Three thousand feet farther up the river the Monroe City ship canal begins. This has a length of 1,600 feet and a depth of 9 feet. From the upper end of this canal to the city wharves is 2,600 feet, with a depth of 8.5 feet. The stream is navigable from the lake to the docks at Monroe only, a distance of 2 miles.

This harbor can not accommodate the larger class of vessels used upon the lakes. The commerce of the harbor consists of fish, sand, dynamite, and coal. It amounted to 9,846 short tons in 1911, valued at $125,670.

The commerce of this stream is too small to have any effect whatever upon the freight rates.

July 1, 1911, balance unexpended	$670.76
June 30. 1912, amount expended during fiscal year, for maintenance of improvement	1.10
July 1, 1912, balance unexpended	669.66

CONSOLIDATED.

July 1, 1911, balance unexpended	$28,651.20
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1.10
July 1, 1912, balance unexpended	28,650.10
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]5,000.00

(See Appendix M M 12.)

13. Black River at Port Huron, Mich.—This stream has its source in the northern part of Sanilac County, flows in a southerly and easterly direction, passing through the city of Port Huron, and empties into the St. Clair River about 2¼ miles below the foot of Lake Huron. It has a length of about 60 miles. The section included in the project is 9,700 feet long. In 1888, when the original survey was made, the lower reach of the Black River, from its mouth to the Grand Trunk Railroad bridge, 1½ miles in length, varied in width from 120 to 150 feet and had a depth of from 10 to 14 feet, except at a few points, where it was obstructed by bars having only 8½ feet of water over them.

The improvement of this stream was inaugurated by the river and harbor act of September 19, 1890, under a project which contemplated dredging to a navigable depth of 16 feet at datum plane, 579.6, from the mouth to the Grand Trunk Railroad bridge, with widths varying from 75 feet to 160 feet, at an estimated cost of $75,000. Operations were commenced in 1891, and the dredging was completed June 30, 1894, at a cost of $34,698.65, including an extension upstream of 1,800 feet to Washington Avenue, authorized by the act of July 13, 1892.

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[1] Exclusive of the balance unexpended July 1, 1912.

The project is based upon a report of examination and survey published in report of Chief of Engineers for 1889, pages 2291–2294 (without map).

The existing project is therefore that of 1890, as modified in 1892, and provides for a channel 16 feet deep from the mouth of the river to Washington Avenue, with widths varying from 75 feet to 160 feet, according to locality.

The datum plane for work under this project, which has heretofore been 579.6, is from 1 to 2 feet higher than the mean surface elevation of Lake Huron during the past two years, has been changed to 577.6, in order to provide the channel depths called for by the adopted project.

The amount expended for maintenance to June 30, 1912, has been $30,808.28, making total expenditure since adoption of project $65,506.28.

There was received during the year 1911, 115,182 short tons of freight, valued approximately at $498,536. This consists mainly of lumber, coal, pulp wood, and gravel.

The effect of the improvement has been to reduce freight rates upon approximately the number of tons received. It is doubtful whether this improvement has any indirect effect upon railroad rates.

The river and harbor act approved July 25, 1912, authorizes a preliminary examination of this locality. Pending the submission of a report on this examination, no estimate for continuing the work of improvement is submitted.

July 1, 1911, balance unexpended	$10,065.91
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	8,572.19
July 1, 1912, balance unexpended	1,493.72
Amount appropriated by river and harbor act approved July 25, 1912	1,500.00
Amount available for fiscal year ending June 30, 1913	2,993.72

(See Appendix M M 13.)

14. Operating and care of St. Clair Flats Canal, Mich.—This canal consists of two dredged cuts through the St. Clair Flats at the mouth of the St. Clair River. These cuts have a width of about 300 feet each, and depth of 20 feet, and extend into Lake St. Clair a distance of 17,460 feet. They are separated by a sand dike 100 feet wide, revetted by sheet piling for a distance of 7,221 feet, and the east cut is protected from wave wash and sand drift by a similar dike 50 feet wide.

An historical sketch of the improvement is given on page 2882 of the Annual Report of the Chief of Engineers for 1896, and a description of recent work is given on pages 694 and 2041 of the Annual Report of the Chief of Engineers for 1907.

The care and maintenance of the canal is provided for by the permanent indefinite appropriation for operating and care of canals and other works of navigation under the provisions of section 4 of the river and harbor act of July 5, 1884, as amended and reenacted by section 6 of the river and harbor act of March 3, 1909.

Operations for the past fiscal year consisted of placing on and around the piers 8,456 tons of stone at a cost of $10,739.12.

A custodian and assistant custodian have been present during the year to enforce canal regulations and care for and repair the dikes.

The expenditures to June 30, 1911, were $214,425.44, with $6.96 outstanding liabilities. The amount expended during the year is $19,771.68.

Freight traffic by calendar years.

	Short tons.		Short tons.
1902	41, 773, 998	1907	66, 271, 962
1903	41, 888, 134	1908	50, 586, 560
1904	38, 044, 929	1909	62, 895, 134
1905	51, 359, 071	1910	68, 965, 947
1906	60, 589, 441	1911	61, 498, 884

For detailed information of commerce, see statistics appended to report of district officer for improving Detroit River, Mich. For effect of improvement on freight rates, see remarks in report on ship channel between Chicago, Duluth, and Buffalo.

(See Appendix M M 14.)

15. Clinton River, Mich.—This river has its source in Oakland County, flows in a generally easterly direction and empties into Anchor Bay, in the northwesterly part of Lake St. Clair. It is about 60 miles long. Before improvement the river had a channel depth of about 10 feet, except at several shoals, over which but 5 or 6 feet could be carried, and a broad flat at the mouth with a general depth of 3 to 4 feet at datum plane 575.7.

The original project for this river was authorized by act of August 30, 1852, which provided for improvement of the harbor at the mouth of the river. Its scope is not known. From that time to 1886 occasional appropriations were made and expended on various dredging projects, amounting to $25,500.

The existing project is based upon report of examination and survey contained in Senate Document No. 199, Forty-sixth Congress, second session, and published in Report of Chief of Engineers for 1880, pages 2062–2066. The project, however, was not approved until June 14, 1889. This project provides for a depth of 8 feet at datum plane 575.7 from the mouth to the city of Mount Clemens, the construction of a pile dike across the flat at the mouth, revetments as needed above, for closing the main channel and making a straight cut through Shoemakers Bend and closing Catfish Channel. Estimated cost $25,000, revised and amended in 1888 and 1889 to $34,564.

The datum plane for work under this project, which has heretofore been 575.7, is from 1 to 2 feet higher than the mean surface elevation of Clinton River during the past two years, has been changed to 573.6 in order to provide the channel depths called for by the adopted project.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth of river [1]					1872	214-215
River to Mount Clemens [1]					1876	549 (Vol. II)
Entrance to river [2]					1882	2338
Mouth of river [1]	House	210	Forty-eighth	Second	1885	2190-2197
River to Mount Clemens [1]	do	184	Fifty-third	Third	1895	2857-2858

[1] No map. [2] Contains map.

No modification has been made in the existing project since its adoption.

During the past year, the river has been redredged, restoring the project depth and width.

Since the completion of the project there has been $26,844.60 expended for maintenance, making the total expenditure since adoption of present project to June 30, 1912, $61,390.86.

As a result of the work done on this river, a channel 8 feet in depth has been secured from the mouth to the city of Mount Clemens, a pile dike has been built along the north side of the outer channel, and revetments have been built where needed in the river above. The present available depth throughout does not exceed 8 feet at 575.7. The river is navigable for small boats a considerable distance above Mount Clemens.

There were received during the year 1911, 12,449 short tons of freight, consisting mainly of logs, coal, beets, and bricks. This is valued approximately at $72,854.

The effect of the improvement on freight rates can not be determined.

July 1, 1911, balance unexpended	$7,234.21
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	6,561.07
July 1, 1912, balance unexpended	673.14
Amount appropriated by river and harbor act approved July 25, 1912	2,000.00
Amount available for fiscal year ending June 30, 1913	2,673.14

(See Appendix M M 15.)

16. Detroit River, Mich.—The Detroit River flows from Lake St. Clair into Lake Erie, generally in a southerly direction, and its length is about 31 miles from Windmill Point Lighthouse at Lake St. Clair to Detroit River Lighthouse at Lake Erie. Before improvement the shoalest part of the channel was at Limekiln Crossing about 8 miles above Detroit River Lighthouse, where the normal depth was from 12½ to 15 feet (at a Lake Erie stage of 571 feet above mean tide at New York) over a bottom of solid rock. The water surface, usually changing slowly, may rise or fall from a few inches during many days of calm weather to about 4 feet during severe storms and to about 6 feet during short severe hurricanes, and the monthly mean may change as much as 2 feet in one year or 4 feet in 40 years. The project covers the river from deep water in Lake Erie to the city of Detroit, a distance of about 24½ miles, of which about 3 miles are in Lake Erie beyond Detroit River Lighthouse.

The first project of 1874 provided for a winding channel at Limekiln Crossing of at least 20 feet in depth, over about 3,000 feet in length and 300 feet width; modified in 1883 so as to somewhat straighten such channel; in 1886 to give 400 feet width; and in 1888 to give 440 feet width. The general depth above and below the Limekiln was 20 feet or more, but the bed of the river was studded with large bowlders and rocky shoals, which limited the safe navigable depth to scant 15 feet through a distance of about 12 miles. The project was modified and extended in 1892 so as to provide for the removal of all obstructive shoals between the city of Detroit and Lake Erie, with a view to obtaining a through channel with a least width of 600 feet and a navigable depth of 20 feet, at a total estimated cost of $1,554,500, as adopted by river and harbor acts of July 13, 1892, and March 3, 1899, and as approved by the War Department at various dates from 1892 up to July 3, 1899. There has been expended on previous projects and modifications thereof $1,554,500.

The present project was adopted by the river and harbor act of June 13, 1902, which provides for a channel 600 feet wide and 21 feet deep from Detroit to Lake Erie. The estimate for the work was increased (see the final report of the survey directed by the act of Mar. 3, 1899, in Annual Report of the Chief of Engineers for 1905, pp. 2292–2296) to $3,750,000, and in accordance with this increase the river and harbor acts of March 3, 1905, and March 2, 1907, authorized the continuation of the improvement to the extent of $700,000 in addition to the $1,750,000 originally authorized. All of this money has been appropriated, but there still remains to be provided for the work $365,000. On November 12, 1904, this project was modified to permit of slightly shifting the location of the proposed channel at Bar Point Shoals, mouth of Detroit River, without increasing the cost.

The river and harbor act of March 2, 1907, modified the present project so as to provide for two channels—one for downbound, the other for upbound vessels, past Bois Blanc Island—in accordance with House Document No. 266 (map), Fifty-ninth Congress, second session (see Annual Report of the Chief of Engineers for 1907, p. 698). The second channel, called the Livingstone Channel (plan B of the report on survey), is to have a least width of 300 feet out to Bar Point, and 800 feet thence to deep water in Lake Erie, with a least depth of 22 feet. This act appropriated $2,000,000 for work on this channel and authorized continuing contracts to the extent of $4,670,950 additional, of which $345,950 has not been appropriated and will not be needed.

The river and harbor act of June 25, 1910, further modified the project of June 13, 1902, so as to provide 22 feet depth north of the junction with Livingstone Channel, and appropriated for this work $560,000. This act also modified the project of March 2, 1907, so as to provide 450 feet width in Livingstone Channel within the cofferdams at Stony Island, in accordance with House Document No. 676, Sixty-first Congress, second session (see Annual Report of the Chief of Engineers for 1910, p. 861), and appropriated $630,000 for that purpose.

More extended information may be found as follows: Annual Report of the Chief of Engineers for 1891, pages 2794–2801 (special history), and 1896, page 2758 (map).

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
20-foot ship channel from Lake Huron to Lake Erie.					1874 [1]	218
Detroit River at Grosse Pointe, for 20 feet.					1890 [1]	2750
American channel, Detroit River					1891 [1]	2808
Ship channel connecting Great Lakes.	House	[2] 207	Fifty-first	Second	1891 [1]	2810
21-foot channel, Detroit, Mich., to Lake Erie.	do	[2] 712	Fifty-sixth	First	1909 [1]	4015
Channel west of Grosse Isle	do	[2] 82	do	Second	1901 [1]	3208
Main channel to Wyandotte, Mich	do	[2] 160	Fifty-eighth	do	1904 [1]	3140
Fighting Island channel	do	[2] 17	Sixty-second	First		

[1] No maps.

[2] Contains maps.

The existing project, as modified, provides for a channel at least 600 feet wide from Detroit to Lake Erie, and 22 feet deep (below a Lake Erie stage of 571 feet) north of the junction with Livingstone Channel and 21 feet deep south of said junction; and for a second channel, known as Livingstone Channel, at the mouth of Detroit River to be 22 feet deep, and 300 feet wide from Grosse Ile to Bar Point, and 800 feet wide, thence to deep water in Lake Erie, except for a length of 5,600 feet at Stony Island, which is to be 450 feet wide.

During the fiscal year work has been prosecuted under nine contracts and by hired labor at Ballards Reef, in the Amherstburg Channel, and under two separate contracts in the Livingstone Channel. About 85 per cent of the work of improving the Amherstburg Channel has been completed and 98 in the Livingstone Channel.

There has been expended to June 30, 1912, on the channel now designated as plan A, $4,374,563.34, of which amount $2,820,063.34 was applied to the present project, adopted in 1902. The amount expended for Livingstone Channel is $6,397,110.21. None of these funds have been applied to maintenance. The project for improving the channel via Amherstburg is now practically completed, except along Ballards Reef and the channel west of Detroit River Lighthouse to deep water in Lake Erie. The improvement along Ballards Reef north of the junction with Livingstone Channel to 22 feet depth is in progress, and that south of this junction will be commenced soon after the opening of Livingstone Channel to navigation. For this latter work $375,000 was appropriated by river and harbor act of February 27, 1911. There has been appropriated $6,955,000 for the Livingstone Channel. The minimum depth in the improved channel is at Ballards Reef, where, on June 30, 1912, there was a depth of 21.75 feet, but due to fluctuations in lake levels this is subject to change. At the mean monthly stage for November, 1911, there was a depth at this locality of 19.44 feet.

The condition of the Livingstone Channel work, on the four sections in which the work was originally divided for contracts, is as follows:

Section 1, of which joins at its upper end with Ballards Reef Channel, is entirely completed for the full project width of 300 feet and depth of 22 feet outside of cofferdam and width of 450 feet and depth of 23 feet within cofferdam. This will be completed about July 10, 1912, with the exception of the material underlying the north dam.

Section 2 is entirely completed for the full project width of 450 feet and depth of 23 feet within cofferdam and width of 300 feet and depth of 22 feet outside of cofferdam, with the exception of the material underlying the south dam. This will be completed about July 31, 1912.

Section 3 continues the channel for 300 feet width and 22 feet depth, and the contractors have about 96 per cent of the work completed.

Section 4, which widens to 800 feet with depth of 22 feet, is entirely completed.

It is expected that the entire channel will be completed and thrown open to navigation late in the season of 1912.

For effect of channel improvements on freight rates, see remarks under this head in report of ship channel connecting waters of the Great Lakes between Chicago, Duluth, and Buffalo.

The amount estimated for profitable expenditure during the fiscal year ending June 30, 1914, will be applied to the completion of channel passing west of Detroit River Lighthouse from 400 to 600 feet width in accordance with project of June 13, 1902, for Plan A channel.

GENERAL IMPROVEMENT.

July 1, 1911, balance unexpended	$824,028.78
June 30, 1912, amount expended during fiscal year, for works of improvement	259,092.12
July 1, 1912, balance unexpended	564,936.66
July 1, 1912, outstanding liabilities	33,117.00
July 1, 1912, balance available	531,819.66
July 1, 1912, amount covered by uncompleted contracts	159,899.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 365,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 365,000.00

LIVINGSTONE CHANNEL.

July, 1911, balance unexpended	$1,382,641.23
June 30, 1912, amount expended during fiscal year, for works of improvement	[2] 824,751.44

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[1] Exclusive of the balance unexpended July 1, 1912.
[2] Includes $0.90 paid by Treasury Department.

July 1, 1912, balance unexpended	$557,889.79
July 1, 1912, outstanding liabilities	254,060.00
July 1, 1912, balance available	303,829.79
July 1, 1912, amount covered by uncompleted contracts	68,009.00
Amount of continuing contract authorization, act of Mar. 2, 1907	4.670,950.00
Amount appropriated under such authorization	4,325,000.00
Amount yet to be appropriated	345,950.00

CONSOLIDATED.

July 1, 1911, balance unexpended	$2,206,670.01
June 30, 1912, amount expended during fiscal year, for works of improvement	1,083,843.56
July 1, 1912, balance unexpended	1,122,826.45
July 1, 1912, outstanding liabilities	287,177.00
July 1, 1912, balance available	835,649.45
July 1, 1912, amount covered by uncompleted contracts	222,908.00
Amount of continuing contract authorization, act of Mar. 2, 1907	4,670,950.00
Amount appropriated under such authorization	4,325,000.00
Amount yet to be appropriated	345,950.00
Amount (estimated) required to be appropriated for completion of existing projects	[1] 365,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 365,000.00

(See Appendix MM 16.)

17. *Removing sunken vessels or craft obstructing or endangering navigation.*—(*a*) Steamer *John B. Ketchan, 2d*, removed from West Neebish channel during 1910; expenditures prior to fiscal year, $697.20; expenditures during present fiscal year, nothing; estimated outstanding liabilities, $11,444.

(*b*) *Steamer Clark.*—The work of removal of this wreck from Black River at Port Huron, Mich., will be undertaken during July, 1912. There were no expenditures during the fiscal year.

(See Appendix MM 17.)

EXAMINATION AND SURVEY REQUIRED BY RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

The local officer was also charged with the duty of making a preliminary examination and survey, provided for by the river and harbor act approved June 25, 1910, of *St. Marys River, Mich.*, *with a view to the removal of shoals and reefs near Detour*, *and reports* thereon will be duly submitted when received.

IMPROVEMENT OF RIVERS AND HARBORS IN THE CLEVELAND, OHIO, DISTRICT.

This district was in the charge of Col. John Millis, Corps of Engineers. Division engineer, Col. C. McD. Townsend, Corps of Engineers.

1. *Toledo Harbor, Ohio.*—The harbor of Toledo is located 99 miles by water and about 120 miles by rail westerly from Cleveland. As

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[1] Exclusive of the balance unexpended July 1, 1912.

at present developed it extends from the head of Maumee Bay about 7 miles up the Maumee River.

Originally, in the bay, the least depth was at ordinary lake level 8.5 feet with a prevailing depth of 12 feet, while in the river the minimum depths were 14 feet.

In 1866 a project was adopted to dredge the channels of deepest water in the bay to a depth of 12 feet. The project was amended from time to time until 1887, when the old indirect channel had a minimum depth of 15 feet.

In 1887 a project was adopted for a straight channel through Maumee Bay, with a depth of 17 feet and a bottom width of 200 feet. The estimated cost, including dikes or other channel protections, was $1,875,000.

The project for a straight channel was amended in 1893 by increasing width of outer section, about 3 miles long, to 300 feet. Since 1892 the improvement has been extended to include the lower 6 miles of the Maumee River.

The total amount expended on original and modified projects prior to operations under existing project is $1,624,695.45.

A project was adopted by the river and harbor act of March 3, 1899, and is described in the Annual Report of the Chief of Engineers, 1898, pages 2693 to 2705, inclusive. It provides for a channel in the bay and river 400 feet wide and 21 feet deep to Fassett Street Bridge and 200 feet wide and 21 feet deep for the section above the bridge, with a turning basin 500 feet wide at the upper end. A dike was also to be constructed 1,000 feet in length between the range lights in the bay. The estimated cost of the work was $1,005,000. A continuing contract was authorized for its execution, the limit of cost being fixed at $950,000, all of which except $15,500 has been appropriated.

The work contemplated by this project has been completed with the exception of the channel and basin above the Fassett Street Bridge, where the channel has a width of only 100 feet.

The river and harbor act of June 25, 1910, appropriated $145,000 for continuing improvement in accordance with the report submitted in House Document No. 865, Sixtieth Congress, first session, and an additional amount of $75,000 was appropriated for continuing the improvement by the river and harbor act of February 27, 1911.

The present project therefore is a modification of that adopted March 3, 1899, and provides for a channel 400 feet wide and a depth that will insure a navigable channel way of 21 feet, which requires a depth of about 23 feet at mean lake level, from deep water in the lake to the Fassett Street Bridge, a distance of about 14 miles, at an estimated additional cost of $400,000, and maintenance of the completed channel at an estimated cost of $25,000 a year.

Maintenance dredging in the channel has been done when necessary by contract and by United States dredging plant.

The total expenditure under the project of 1899 and subsequent modifications to the close of the fiscal year ending June 30, 1912, was $1,094,578.93, of which amount $209,937.65 was for maintenance during the past nine years. Prior to that time the amounts expended for works of improvement and for maintenance were so involved that it is impracticable to separate them.

The work contemplated by the modified project is regarded as about 70 per cent completed.

During the past year the U. S. dredge *Burton* excavated 53,347 cubic yards of material from the Maumee River, and 32,184 cubic yards of material from the channel through Maumee Bay. Cost of maintaining dredging plant and of raising the U. S. dredge *Maumee*, which was wrecked on the breakwater at Cleveland, was also charged in part to this appropriation.

Under a contract for deepening the channel through Maumee Bay and Maumee River to 21 feet below low water of 1895, dated June 19, 1911, work has been about 53 per cent completed. Five hundred and ninety-one thousand one hundred and ninety-four cubic yards of material has been removed and the required depth has been secured over the outer 13,900 feet of channel and in part over 6,900 feet additional.

The result of these expenditures has been to create and maintain a channel through Maumee Bay and River 400 feet wide and 23 feet deep for the outer 2¼ miles, 400 feet wide and 21 feet deep thence 12½ miles up to Fassett Street Bridge, and to a width of 100 feet and a depth of 20 feet for 1 mile above this bridge. The Maumee River is also navigable for launches to Perrysburg, 15 miles above the mouth.

The usual variations in the level of the water surface during the season of navigation range from 1 foot above to 2 feet below mean lake level. Temporary fluctuations, due to wind, of 7.9 feet above to 7.1 feet below mean lake level have, however, been observed at Toledo.

All depths are referred to mean lake level, 1860–1875, elevation 572.77 feet above mean tide at New York.

The commerce for Toledo for the calendar year 1911 amounted to 6,407,878 short tons, a decrease of 12,514 tons from that reported for the calendar year 1910.

There has been a marked reduction in freight rates since the project was inaugurated, but it is impracticable to determine how much of this reduction is due to this particular improvement.

The appropriation recommended will be applied toward continuing improvement by dredging under existing project, and for maintenance.

For report on preliminary examination and survey of Maumee River, Ohio, from deep water in Lake Erie to the Fassett Street Bridge, Toledo, with a view to obtaining greater depth and increased width of approximately 100 feet, see Report of Chief of Engineers, 1908, page 761, paragraph 3, and House Document No. 865, Sixtieth Congress, first session. (No maps.)

July 1, 1911, balance unexpended		$221,314.65
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$51,668.94	
For maintenance of improvement	23,110.09	
		74,779.03
July 1, 1912, balance unexpended		146,535.62
July 1, 1912, outstanding liabilities		30,934.69
July 1, 1912, balance available		115,600.93
Amount appropriated by river and harbor act approved July 25, 1912		75,000.00
Amount available for fiscal year ending June 30, 1913		190,600.93

July 1, 1912, amount covered by uncompleted contracts	$80,478.18
Amount (estimated) required to be appropriated for completion of existing project	[1] 105,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and maintenance	[1] 105,000.00

(See Appendix N N 1.)

2. Port Clinton Harbor, Ohio.—The harbor of Port Clinton comprises the lower half mile of the Portage River. It is about 72 miles westerly from Cleveland by both land and water. The Portage River in its natural condition was rarely more than 5 feet deep across the bar at its mouth.

The original project for its improvement was adopted in 1871 and was slightly modified in 1872 and 1873. It provided for the construction of two parallel jetties extending outward from the mouth of the river to a depth of 10 feet in the lake, at an estimated cost of $90,000. These were to be built of timber and stone.

In 1883 the east jetty had been extended 2,180 linear feet and the west jetty 1,948 linear feet. These lengths were thought sufficient for the requirements of this harbor, and in 1894, at which time a total expenditure of $71,949.86 had been made, it was recommended that the remainder of the estimated cost of executing the project ($21,000) be expended for necessary repairs.

No work under contract has been done at Port Clinton during the year.

Government property has been stored on the Government reservation at Port Clinton during the year, and a watchman has been employed for its care.

The project since 1894 has been one for maintenance, under which $33,411.58 has been expended for dredging, repairing the jetties, and contingencies.

The result of expenditures has been to produce a channel about 10 feet in depth, extending for one-half mile above the mouth of the Portage River, which was the maximum draft that could be carried June 30, 1912. A channel of 6 feet depth extends to Oak Harbor, 12 miles above the mouth of the river.

All depths are referred to mean lake level, 1860–1875, elevation 572.77 feet above mean tide at New York.

The commerce of Port Clinton for the calendar year 1911 amounted to 8,052 short tons, a decrease of 2,725 tons from that reported for the calendar year 1910.

The project has had little effect on freight rates, as the commerce of the port is small.

The appropriation recommended will be applied to maintenance to keep the improvement available.

For report on preliminary examination and survey of Port Clinton Harbor, Ohio, see Report of the Chief of Engineers for 1910, page 879, and House Document No. 815, Sixty-first Congress, second session, with map.

July 1, 1911, balance unexpended	$190.71
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	52.15

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[1] Exclusive of amount available for fiscal year 1913.

July 1, 1912, balance unexpended	$138.56
Amount appropriated by river and harbor act approved July 25, 1912	500.00
Amount available for fiscal year ending June 30, 1913	638.56
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 500.00

(See Appendix N N 2.)

3. *Sandusky Harbor, Ohio.*—The harbor of Sandusky is located about 57 miles by water and 60 miles by rail westerly from Cleveland, Ohio. The harbor is in the lower part of Sandusky Bay, some two miles from the lake and is situated along the city front, which is developed for a length of about 1¼ miles. In its natural condition the depth was only such as the bay afforded, which was about 10 feet along the city front and from 9 to 12 feet thence to the lake, at ordinary lake level.

A long, flat sand bar divided the bay from the lake, this bar being cut through by a channel from 1,000 to 2,000 feet in width near its central portion. The southern part of the bar is called Cedar Point and the northern Sand Point. Between these two points the currents between the bay and the lake had maintained the channel to a depth of not less than 18 feet for a distance of a mile or more.

The first appropriation was made for a survey in 1826, and the first improvement was made in 1844, consisting in the construction of a dam to close a breach across Sand Point. With this exception, all the improvements made previous to 1896 consisted in deepening natural channels and in making a new straight channel from the city front to Cedar Point and in removing sand and bowlders from the dock channel along the city front. Natural causes since 1826 have washed away a greater part of Sand Point.

In 1896 and subsequently the project was added to so as to provide for the construction of parallel jetties of stone upon mattress foundations extending from Cedar Point and Sand Point outward, with a view to confining and directing the flow of water to and from the bay for the purpose of maintaining the channel. Provision was also made for the construction of certain spurs and mattresses for the protection of the channel near Cedar Point and at the point of the bar near the lighthouse.

Under the original project thus modified there was expended $477,149.09.

The project, authorized by the river and harbor act of March 3, 1899, is described in the Annual Report of the Chief of Engineers for 1898, pages 2708 to 2716, inclusive. It provides for an east jetty of stone upon brush mattresses extending from Cedar Point about 5,000 feet into the lake; for a west jetty about 5,550 feet long on the opposite side of the channel, about 750 feet distant; for the protection of the crest of the bar and shore of Sand Point with a low dam of brush and stone, and for a deflecting dike for the inner bar 1,500 feet long and dredging to 17 feet. The estimated cost was $425,796, of which $317,796 was for permanent works. By the river and harbor act of June 13, 1902, the project was modified so as to provide for dredging a channel 21 feet deep at mean lake level with a width of 400 feet in the approaches to the harbor front and 300 feet in the harbor channel, at an estimated cost of $781,000, as described in the Report of the Chief of Engineers, 1901, pages 3270 to 3277, inclusive. The estimated cost of the entire project as revised in 1903 was $1,135,000.

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[1] Exclusive of amount available for fiscal year 1913.

The act of March 3, 1905, modified the project by omitting therefrom the excavation of rock other than that already provided for by contract in the dock channel and fixed the limit of expenditures at $815,000. Continuing contracts in excess of cash appropriations were authorized by the same act to the amount of $480,000, of which $130,000 remains to be appropriated. The act of March 2, 1907, restored this work of rock removal to the project and appropriated $125,000 for maintenance and continuing the improvement. In the interim the city of Sandusky had removed considerable rock from the channel.

The total expended under the present project for improving Sandusky Harbor to June 30, 1912, was $719,610.15, of which amount $49,615.55 was for maintenance during the past nine years. Prior to that time the amounts expended for works of improvement and for maintenance were so involved that it is impracticable to separate them.

Dredging has been carried on during the year by United States dredging plant. The dredge *Burton* removed 52,362 cubic yards of material from the outer channels, and the United States dredge *Maumee* removed 22,905 cubic yards of mud and bowlders from the dock or inner channel. Cost of maintaining dredging plant, including raising the wrecked dredge *Maumee*, was charged in part to this appropriation.

Under date of July 25, 1911, a contract was entered into for extending the east jetty to a total length of 5,000 feet. Under this contract the jetty has been extended about 500 feet, and the work is about 11 per cent completed.

The result of expenditures has been to create a channel 300 feet wide and 22 feet deep through the outer bar, 400 feet wide and 21 feet deep to the city front, and 160 to 300 feet wide and 21 feet deep along the city front to the Short Line docks. The project as a whole is regarded as about 75 per cent completed. These depths and widths are, however, subject to variations due to shoaling.

There is a general depth of 10 feet in Sandusky Bay to the mouth of the Sandusky River, 14 miles above the city, and of 8 feet in the river to Fremont, Ohio, 18 miles above its mouth, but there is practically no navigation above Sandusky. Sand bars in the river reduce the available depths to about 4 feet. The usual variation in the level of the water surface is the same as at Toledo, with extreme fluctuations of 5 feet above and below mean lake level within the bay.

The commerce of the harbor of Sandusky for the calendar year 1911 amounted to 2,279,318 short tons, an increase of 320,156 tons over that reported for the calendar year 1910.

There has been a marked reduction in freight rates since the project was inaugurated, but it is impracticable to determine how much of this reduction is due to this particular improvement.

The available funds will be applied toward completing the project and to maintenance to keep the improvement available.

Owing to changes in local conditions since the existing project was adopted, the local officer is of the opinion that certain modifications of the plan of improvement would be desirable, and a reexamination of the locality with a view to revision of the project is, therefore, recommended.

For report on preliminary examination of Sandusky River, Ohio, from its mouth to Fremont, see Report of the Chief of Engineers, 1904, page 609, and House Document No. 242, Fifty-eighth Congress, second session. (No map.)

July 1, 1911, balance unexpended		$135,367.51
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$25,323.96	
For maintenance of improvement	9,610.79	
		34,934.75
July 1, 1912, balance unexpended		100,432.76
July 1, 1912, outstanding liabilities		3,445.40
July 1, 1912, balance available		96,987.36
July 1, 1912, amount covered by uncompleted contracts		22,178.51
Amount of continuing-contract authorization, act of Mar. 3, 1905		480,000.00
Amount appropriated under such authorization		350,000.00
Amount yet to be appropriated		130,000.00

(See Appendix N N 3.)

4. *Huron Harbor, Ohio.*—This harbor comprises the lower mile of the Huron River and is located about 48 miles by water and 49 miles by rail westerly from Cleveland, Ohio. In its natural condition the entrance was practically closed to navigation by a sand bar.

The first project for its improvement was adopted in 1826 and provided for the construction of two parallel jetties 140 feet apart, extending outward through the bar at the river mouth. These jetties were lengthened from time to time and repaired as required, and the channel was finally deepened by dredging.

The total amount expended upon these projects for all purposes of construction and maintenance to June 30, 1905, was $269,789.07.

The present project for the improvement of this harbor was authorized by the river and harbor act of March 3, 1905. It is based upon a survey, plan, and estimate called for by the river and harbor act of June 13, 1902, and is published in full in the Report of the Chief of Engineers for 1904, pages 3209 to 3218, inclusive, and in House Document No. 122, Fifty-eighth Congress, second session.

It provides for rebuilding 580 feet of the west jetty, extending it 240 feet, and constructing a pierhead 50 feet square at its outer end; for a second pierhead of the same dimensions and 300 feet easterly from it; for a jetty or breakwater extending from this east pierhead to a point on shore 1,200 feet easterly from the channel; for the removal of the old east jetty; and for the dredging of the channel and a part of the sheltered area to a depth of 21 feet below mean lake level, at an estimated cost of $315,500, and an annual expenditure of $2,500 for maintenance.

In the spring of 1904 it was necessary to make an allotment of $40,000 from the river and harbor act of April 28, 1904, for the maintenance of this harbor. This money has been expended in rebuilding about 490 linear feet of the shoreward end of the west jetty, which was in such a dilapidated condition that it threatened to give way and to involve the destruction of the channel. This extension directly advanced the project and diminished proportionally the amount required for its completion.

The river and harbor act of March 3, 1905, appropriated $68,500 and authorized contracts to be entered into for $200,000 more for the completion of the new projects. Of this latter sum all but $3,000 has now been appropriated.

The amount expended under the existing project to June 30, 1912, was $267,785.58, of which amount $76,463.33 was for maintenance during the past nine years. Prior to that time the amounts expended for works of improvement and for maintenance were so involved that it is impracticable to separate them.

Minor repairs were made to the piers. Government property has been stored at Huron, and a watchman has been employed for its care, as well as to look after the Government works. Cost of raising the wrecked dredge *Maumee* was charged in part to this appropriation.

All the work contemplated by the project has been completed. The result of expenditures has been to obtain a channel 200 feet wide and 21 feet deep at mean lake level through the outer bar and jettied channel for a distance of three-fourths of a mile.

A channel 8 feet deep extends to Milan, 8 miles above the mouth, but there is practically no navigation on this part of the river.

All depths are referred to mean lake level, 1860–1875, elevation 572.77 feet above mean tide at New York.

The commerce of Huron Harbor for the calendar year 1911 amounted to 1,257,724 short tons, an increase of 65,464 tons over that reported for the calendar year 1910.

There has been a marked reduction in freight rates since the project was inaugurated, but it is impracticable to determine how much of this reduction is due to this particular improvement.

The available funds will be applied to maintenance to keep the improvement available.

For report on preliminary examination and survey of Huron Harbor, Ohio, with a view to securing a channel with a depth of 20 feet, see Report of the Chief of Engineers for 1904, page 609, and House Document No. 122, Fifty-eighth Congress, second session, with a map and plan showing the proposed improvements.

July 1, 1911, balance unexpended	$30,469.40
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	6,243.67
July 1, 1912, balance unexpended	24,225.73
July 1, 1912, outstanding liabilities	91.26
July 1, 1912, balance available	24,134.47
Amount of continuing contract authorization, act of Mar. 3, 1905	268,500.00
Amount appropriated under such authorization	265,500.00
Amount yet to be appropriated	3,000.00

(See Appendix N N 4.)

5. Vermilion Harbor, Ohio.—Vermilion Harbor comprises the lower 3,000 feet of Vermilion River and is located about 39 miles by water and 37 miles by rail westerly from Cleveland, Ohio. In the natural condition of the harbor there was only about 2 feet of water across the bar at its mouth.

The improvement of this harbor was first undertaken in 1836, when an appropriation of $10,000 was made for the purpose. The original project provided for parallel jetties extending outward to 12 feet of water in the lake. The jetties were built, but the current only sufficed to maintain a channel of about 7 feet depth across the bar at ordinary lake level. Dredging was accordingly resorted to and the project enlarged to provide for a depth of 14 feet of water. This involved the removal of rock, and the project was never fully executed.

The total amount of money expended on the original project is $133,277.55.

The amount expended on the existing project, which is for maintenance, to June 30, 1912, was $31,507.17.

The amount expended during the year was for contingencies.

The result of expenditures has been to provide a channel 12 feet deep to the inner end of the piers. A channel of 8 feet extends to the Lake Shore Railway bridge, one-half mile above. The water-surface fluctuations are similar to those at Huron or Lorain. All depths are referred to mean lake level, 1860–1875, elevation 572.77 feet above mean tide at New York.

The commerce of Vermilion during the calendar year 1911 amounted to 1,608 short tons, a decrease of 478 tons from that reported for the calendar year 1910.

The improvement has had little effect on freight rates, as the tonnage of the port is small.

The available funds will be applied to maintenance, to keep the improvement available.

For report on preliminary examination of Vermilion Harbor, Ohio, see Report of the Chief of Engineers for 1904, page 609, and House Document No. 252, Fifty-eighth Congress, second session. (No map.)

July 1, 1911, balance unexpended	$1,497.98
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	5.15
July 1, 1912, balance unexpended	1,492.83

(See Appendix N N 5.)

6. *Lorain Harbor, Ohio.*—This harbor comprises the lower 3 miles of Black River and is located about 30 miles by water and 27 miles by rail westerly from Cleveland, Ohio. In its natural condition the depth of water at the mouth of the river at ordinary lake level did not exceed 3 feet, but the river itself was navigable for a distance of 3 miles from its mouth for all vessels then in use upon the lake.

The first project, adopted in 1828, provided for the construction of parallel piers 200 feet apart, running out to a depth of 16 feet in the lake. This project was modified in 1873 and 1880. The piers have been rebuilt and extended from time to time to keep pace with increasing requirements, and dredging has been resorted to to secure a greater depth than the natural currents would afford. The amount expended on this project was $292,202.88.

A project was adopted by the river and harbor act of March 3, 1899. The project in detail is given in full in the Annual Report of the Chief of Engineers for 1898, pages 2718 to 2724, inclusive. It provided for the construction of two rubble-mound breakwaters converging toward the lake, having an opening between them at their outer extremities 500 feet in width and in prolongation of the axial line of the jettied channel. It also provided for repairing the jetties and for dredging the protected areas to a depth of 20 feet. The estimated cost was $695,500.

The river and harbor act of June 6, 1900, authorized a maximum increase of cost of 10 per cent over the original estimates. The project was modified by the river and harbor act of March 3, 1909, to include an extension of the west arm of the breakwater to or toward shore with funds previously appropriated. A still further modification was authorized by the river and harbor act of June 25, 1910, which provided for extension of both the east and west arms, and dredging in the harbor at an estimated cost of $248,129, with annual maintenance of $5,000, in accordance with the report printed in House Document No. 644, Sixty-first Congress, second session. The present project, therefore, is that adopted March 3, 1899, with the subsequent modifications above described.

There has been expended under the approved project to June 30, 1912, $757,558.56, of which amount $36,746.61 was for maintenance during the past nine years. Prior to that time the amounts expended for works of improvement and for maintenance were so involved that it is impracticable to separate them.

Under various contracts prior to the present fiscal year the east and west piers were entirely rebuilt, two breakwaters were built, the western one 1,800 feet long, the eastern one 1,500 feet long, and pierheads were constructed at the entrance of the outer harbor.

During the year the work of extending the east and west breakwaters shoreward has been in progress under a contract dated September 10, 1910. This work is about 58 per cent completed.

The U. S. dredge *Burton* removed 29,432 cubic yards of material from the entrance channel and from the area under shelter of the breakwaters. This work was in part maintenance and in part improvement in accordance with the approved project. The cost of maintaining dredging plant was charged in part to this appropriation.

The result of expenditures has been to provide a jettied channel 21 feet deep and a channel of approach protected by deflected breakwaters. The project is regarded as 88 per cent completed.

A channel 21 feet deep, which is maintained by local authorities, extends 3 miles up the river to the steel plant.

All depths are referred to mean lake level, 1860–1875, elevation 572.77 feet above mean tide at New York.

The water surface fluctuations are similar to those at Cleveland.

The commerce of Lorain Harbor for the calendar year 1911 amounted to 6,454,267 short tons, an increase of 439,929 tons over that reported for the calendar year 1910.

There has been a marked reduction in freight rates since the project was inaugurated, but it is impracticable to determine how much of this reduction is due to this particular improvement.

For reports on preliminary examination and survey of Lorain Harbor, Ohio, including that portion of Black River from the inner end of the Government piers to the East Erie Avenue Bridge, see Report of the Chief of Engineers for 1908, page 761, and House Document No. 560, Sixtieth Congress, first session (no map), and for preliminary examination and survey of Lorain Harbor, Ohio, with a view to enlarging and improving the outer harbor area, etc.; see Report of the Chief of Engineers for 1910, page 879, and House Document No. 644, Sixty-first Congress, second session, with map showing proposed improvements.

July 1, 1911, balance unexpended		$239, 054. 94
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$69, 852. 01	
For maintenance of improvement	680. 00	
		70, 532. 01
July 1, 1912, balance unexpended		168, 522. 93
July 1, 1912, outstanding liabilities		5, 243. 42
July 1, 1912, balance available		163, 279. 51
July 1, 1912, amount covered by uncompleted contracts		81, 921. 83

(See Appendix N N 6.)

7. *Cleveland Harbor, Ohio.*—Originally Cleveland Harbor was simply the mouth of Cuyahoga River, in which the water was shoal, and sometimes the entrance was entirely closed to boats by the sand. The first improvement was undertaken in 1825, and the plan contemplated straightening the channel and making it permanent by side jetties. The channel was dredged when necessary. The total expenditure under this plan was $346,244.84.

In 1875 a project was adopted for a breakwater of stone-filled timber cribs in 5 fathoms of water. The west breakwater was commenced in 1876 and completed in 1883, a total length of 7,130 feet. The east breakwater was commenced in 1888 and continued at intervals until 1893, when its length was 2,494.5 feet. In 1895 an opening of 200 feet was made in the shore arm of the west breakwater as a sanitary measure.

In 1896 Congress authorized the completion of the improvement at a total estimated cost not to exceed $1,354,000, in accordance with a project published in Annual Report of the Chief of Engineers for 1896, pages 2949 to 2953, inclusive. This project involved the completion of the east breakwater, providing for an additional length of about 3,000 feet; removing superstructure of the old west breakwater to a depth of 2 to 3 feet below water level and replacing it with a superstructure of concrete masonry; reenforcing the cribs below the masonry; sheathing the face of the east breakwater; removing and rebuilding the east and west piers and widening the mouth of the river. A continuing contract for the work was authorized.

The river and harbor act of 1899 authorized the deepening of the channel and sheltered area by dredging to a depth of 21 feet, which depth was increased to 25 feet by the river and harbor act of June 13, 1902. The estimated cost of the work was $478,400. (See Annual Report of the Chief of Engineers for 1899, pp. 3076 to 3078, inclusive, for project, and p. 3061 for estimate as revised.)

The river and harbor act of June 13, 1902, authorized a further modification of the project by providing for improving and enlarging the entrance to the harbor and for extending the breakwater eastward to Gordon Park, in the city of Cleveland, a distance of about 16,000 feet, at a total estimated cost of $4,481,456. This project is described in the Annual Report of the Chief of Engineers for 1901, pages 3277 to 3299, inclusive. The act authorized an expenditure of $2,800,000, all of which has been appropriated, but this authorization was increased by $900,000 in the river and harbor act of March 2, 1907, of which $51,000 is yet to be appropriated. This act also appropriated $98,000 for the construction of a Government dock at the foot of Erie Street, in the city of Cleveland, in accordance with plan printed in House Document No. 270, Fifty-ninth Congress, second session, contingent upon the consent of the Cleveland Yacht Club, which holds a lease of this frontage.

The river and harbor act of June 25, 1910, authorized the connecting of the timber portion of the east breakwater with the new east breakwater extension and the removal of the inclined breakwater, and appropriated $250,000, in addition to authorizing $75,000 from previous appropriations, or a total of $325,000 for this work.

The existing project for the improvement of Cleveland Harbor is therefore a combination of those authorized by the acts of 1875, 1896, 1899, 1902, 1907, and 1910.

There has been expended on the authorized project to June 30, 1912, $6,573,821.26, of which amount $575,541.20 was for maintenance during the past nine years. Prior to that time the amounts expended for works of improvement and for maintenance were so involved that it is impracticable to separate them.

Prior to the present fiscal year, under various contracts, the mouth of the river was widened by dredging, and the east and west piers were rebuilt, as intended, except a small amount of pier construction and excavating on the westerly side of the river in the vicinity of the Lake Shore Railway bridge to widen the channel. This work is waiting for title to the necessary real estate, which the city of Cleveland has undertaken to acquire for the United States. The superstructure of the west breakwater was removed and replaced by concrete masonry and the lake side of the cribs was partly protected with riprap. The old east breakwater was repaired and extended according to the project of 1896, except as modified by the river and harbor act of June 13, 1902, which reduced the length of the inclined shore arm by 270 feet. The new main entrance was completed. This work consists of two pierheads, two projecting breakwaters, and rubble mound protection to the old structure. The westerly 10,000 feet of the east breakwater extension is completed. The wharf at the foot of East Ninth Street is completed.

From 1899 to 1904, 766,928 cubic yards of material was excavated in the harbor. This was in the nature of maintenance work. Since 1904 dredging in the basins and jettied channel has been carried on as available funds permitted.

During the fiscal year the following work was accomplished: Work was in progress under a contract dated January 14, 1909, for the further extension of the east breakwater and is now about 69 per cent completed; work was in progress under a contract dated November 18, 1910, for constructing a section of breakwater to close the "gap" at the foot of East Ninth Street and for removing the inclined arm of the old east breakwater, and is now about 72 per cent completed; work was in progress under a contract dated December 12, 1910, for repairing the timber portion of the east breakwater and is now about 97 per cent completed.

The U. S. dredge *Burton* removed 20,946 cubic yards of material from the east basin.

The construction of the further extension of the east breakwater is being carried on under a continuing contract authorization, and the sum of $51,000 is estimated for this work during the year 1914. An estimate of $25,000 is also submitted for the year 1914 for maintenance of the completed works of improvement, including dredging and repairs to breakwaters.

As a result of the expenditures a navigable channel 25 feet in depth has been provided at the mouth of the river, and the large outer harbor has been partially constructed, a portion of which is available for docks and anchorage. The project as a whole, so far as definitely authorized by Congress, is regarded as 90 per cent completed.

Cuyahoga River has a navigable depth of about 20 feet for a distance of about 5½ miles above its mouth and is maintained by local authorities.

The usual variation in the level of the water surface during the season of navigation is from 1 foot above to 2 feet below mean lake level. Fluctuations due to wind are about 2 feet.

All depths are referred to mean lake level, 1860–1875; elevation, 572.77 feet above mean tide at New York.

The commerce of Cleveland Harbor for the calendar year 1911 amounted to 10,949,760 short tons, a decrease of 2,436,846 tons from that reported for the calendar year 1910.

There has been a marked reduction in freight rates since the project was inaugurated, but it is impracticable to determine how much of this reduction is due to this particular improvement.

For report on preliminary examination of Cleveland Harbor, Ohio, with a view to obtaining wharf room for the storage of material and plant and other Government property, see Report of the Chief of Engineers for 1907, page 717, and House Document No. 270, Fifty-ninth Congress, second session (with map of the locality and details of the wharf).

UNDER CONTRACTS, ETC., AUTHORIZED BY ACT OF JUNE 3, 1896.

July 1, 1911, balance unexpended	$87,292.80
June 30, 1912, amount expended during fiscal year, for works of improvement	17.50
July 1, 1912, balance unexpended	87,275.30

DREDGING AND REPAIRS TO BREAKWATERS.

July 1, 1911, balance unexpended	$50,861.51
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	43,194.42
July 1, 1912, balance unexpended	7,667.09
July 1, 1912, outstanding liabilities	7,319.63
July 1, 1912, balance available	347.46
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 25,000.00

WHARF ROOM.

July 1, 1911, balance unexpended	$12,663.95
July 1, 1912, balance unexpended	12,663.95

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[1] Exclusive of the balance unexpended July 1, 1912.

FOR BREAKWATER, CLOSING GAP, AND REMOVING OLD ARM.

July 1, 1911, balance unexpended	$281,878.84
June 30, 1912, amount expended during fiscal year, for works of improvement	110,107.03
July 1, 1912, balance unexpended	171,771.81
July 1, 1912, outstanding liabilities	13,191.74
July 1, 1912, balance available	158,580.07
July 1, 1912, amount covered by uncompleted contracts	119,158.15

MAIN ENTRANCE, EAST BREAKWATER EXTENSION, ETC., ACTS OF JUNE 13, 1902, AND MAR. 2, 1907.

July, 1, 1911, balance unexpended	$354,338.83
June 30, 1912, amount expended during fiscal year, for works of improvement	129,116.31
July 1, 1912, balance unexpended	225,222.52
July 1, 1912, outstanding liabilities	15,748.26
July 1, 1912, balance available	209,474.26
Amount appropriated by sundry civil act approved Aug. 24, 1912	200,000.00
Amount available for fiscal year ending June 30, 1913	409,474.26
July 1, 1912, amount covered by uncompleted contracts	378,931.51
Amount of continuing contract authorization, act of Mar. 2, 1907	900,000.00
Amount appropriated under such authorization	849,000.00
Amount yet to be appropriated	51,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 51,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 51,000.00

CONSOLIDATED.

July 1, 1911, balance unexpended		$787,035.93
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$239,240.84	
For maintenance of improvement	43,194.42	
		282,435.26
July 1, 1912, balance unexpended		504,600.67
July 1, 1912, outstanding liabilities		36,259.63
July 1, 1912, balance available		468,341.04
Amount appropriated by sundry civil act approved Aug. 24, 1912		200,000.00
Amount available for fiscal year ending June 30, 1913		668,341.04
July 1, 1912, amount covered by uncompleted contracts		498,089.66
Amount of continuing contract authorization, act of Mar. 2, 1907		900,000.00
Amount appropriated under such authorization		849,000.00
Amount yet to be appropriated		51,000.00
Amount (estimated) required to be appropriated for completion of existing project		[1] 51,000.00

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[1] Exclusive of amount available for fiscal year 1913.

Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	[1] $51,000.00
For maintenance of improvement	[1] 25,000.00
Total	76,000.00

(See Appendix N N 7.)

8. *Fairport Harbor, Ohio.*—This harbor comprises the lower mile of Grand River and is located 34 miles by water and 32 miles by rail easterly from Cleveland, Ohio. Before the improvement was undertaken the mouth of the river was at times entirely closed by the formation of sand bars.

The first improvement was undertaken in 1825, and the original project provided for the construction of parallel jetties of cribwork filled with stone, placed about 200 feet apart, and extending outward across the bar and into the lake. The jetties were extended from time to time until the west jetty attained a length of 2,370 feet and the east jetty 1,765 feet from the original shore line. These jetties have been repeatedly repaired and rebuilt as necessities required, and the channel has been deepened and dredged many times.

The total expended to June 30, 1896, on the original project was $368,940.09.

By the river and harbor act of June 3, 1896, the existing project for this improvement was adopted. This project is described in the Report of the Chief of Engineers for 1896, pages 2956 to 2958, inclusive, and provides for the construction of two breakwaters converging toward the lake, the outer ends being in deep water, and sufficient space being left between them to afford an easy entrance to the jettied channel. The breakwaters were to terminate in pierheads 50 feet square, the west breakwater to have a length of 2,050 feet and the east breakwater 1,350 feet. The estimated cost of the work, including dredging between the breakwaters to a depth of 20 feet, was $510,000, which was revised to $585,000 in 1900. (See Annual Report of the Chief of Engineers for 1900, pp. 4071–4072.)

The project was further modified by the river and harbor act of March 3, 1905, which provides that the westerly arm of the breakwater may be extended to a point at or near the shore, the expense thereof to be paid from the appropriations therein and theretofore made. The estimated cost of this extension was $120,000.

The river and harbor acts of June 13, 1902, and March 3, 1905, provided also for maintenance of the old work. Five hundred and eighty linear feet of the shoreward end of the east jetty was rebuilt of timber cribs with concrete top and 570 linear feet of the west jetty was sheathed and capped with concrete and stone. The outer portions have been sheathed below water and otherwise repaired. The west breakwater and west pierhead have been completed. Dredging has been done as necessary to maintain the channel.

The river and harbor act of June 25, 1910, made an appropriation of $100,000 for continuing improvement and for maintenance, and authorized continuing contracts in the sum of $150,000 additional for completing the project. The sundry civil act of March 4, 1911, appropriated $105,000, and the sundry civil act of August 24, 1912, appropriated the remainder, $45,000.

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[1] Exclusive of amount available for fiscal year 1913.

There has been expended on the existing project to June 30, 1912, $648,133.73, of which amount $128,499.59 was for maintenance during the past nine years. Prior to that time the amounts expended for works of improvement and for maintenance were so involved that it is impracticable to separate them.

During the fiscal year work was in progress under a contract dated October 25, 1910, for constructing the east breakwater and pierhead, and is now about 45 per cent completed.

The U. S. dredge *Burton* removed 7,121 cubic yards of material from the entrance channel, which had shoaled slightly.

Work on the east breakwater and east pierhead is being carried on under continuous-contract appropriations.

The result of expenditures has been to obtain a channel 21 feet deep at mean lake level across the bar at the mouth of the river and to protect the entrance from westerly storms. The project is regarded as about 71 per cent completed.

Grand River is navigable for about 1 mile above its mouth.

The water-surface variations are similar to those at Cleveland.

All depths are referred to mean lake level, 1860–1875; elevation 572.77 feet above mean tide at New York.

The commerce of Fairport Harbor for the calendar year 1911 amounted to 1,455,699 short tons, a decrease of 914,467 tons from that reported for the calendar year 1910.

There has been a marked reduction in freight rates since the project was inaugurated, but it is impracticable to determine how much of this reduction is due to the particular improvement.

July 1, 1911, balance unexpended		$209,035.71
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$64,113.38	
For maintenance of improvement	680.00	
		64,793.38
July 1, 1912, balance unexpended		144,242.33
July 1, 1912, outstanding liabilities		7,107.23
July 1, 1912, balance available		137,135.10
Amount appropriated by sundry civil act approved Aug. 24, 1912		45,000.00
Amount available for fiscal year ending June 30, 1913		182,135.10
July 1, 1912, amount covered by uncompleted contracts		91,449.85
Amount of continuing-contract authorization, act of June 25, 1910		250,000.00
Amount appropriated under such authorization		250,000.00

(See Appendix N N 8.)

9. *Ashtabula Harbor, Ohio.*—This harbor comprises the lower 1¾ miles of the Ashtabula River and about 1 mile of the lake front at its mouth. It is located 61 miles by water and 56 miles by rail easterly from Cleveland, Ohio. In its natural condition the mouth of the river was obstructed by a bar upon which the depth of water varied according to weather conditions. The greatest depth that could prevail was about 9 feet, this being the depth to underlying rock near the shore line.

The original project for the improvement of this harbor was adopted in 1826 and provided for the construction of two parallel jetties extending outward into the lake. These jetties were rebuilt and repaired from time to time until replaced by privately owned bulkheads, and the channel has been deepened by dredging to meet the increased demands of commerce, the project being modified accordingly.

The total amount expended on the original project was $565,192.27.

A project was adopted under the authority of the river and harbor act of 1896 and is described in the Report of the Chief of Engineers for 1895, pages 3122 to 3126, inclusive, and provides for the construction of two breakwaters, each 1,500 feet long, and two pierhead cribs at an estimated cost of $465,000. This plan was modified as explained in the Annual Report of the Chief of Engineers for 1896, pages 2963 and 2964, to provide a west breakwater 1,800 feet long and an east breakwater 1,200 feet long.

The river and harbor act of March 3, 1899, authorized a continuing contract to be made for the construction of these breakwaters, at a cost not to exceed $430,000, all of which has since been appropriated.

The river and harbor act of March 3, 1905, authorized the expenditure of the unexpended balance on hand to the credit of the improvement for the extension of the west breakwater to a point at or near the shore, and the funds have been applied toward the prolongation of the west breakwater 1,580 feet.

The river and harbor act of June 25, 1910, appropriated $115,000 and authorized continuing contracts for an additional amount not to exceed $376,430, these amounts to be applied to continuing the improvement in accordance with the report contained in House Document No. 654, Sixty-first Congress, second session. This report includes a plan for constructing extensions at both ends of the existing west breakwater, for a new east breakwater, and the removal of a portion of the old, at an estimated cost of $1,385,529, with an annual maintenance charge of about $5,000.

The present project is that adopted in 1896, as modified and enlarged by the river and harbor acts of 1905 and 1910.

The river and harbor act of February 27, 1911, authorized continuing contracts for prosecution of this improvement in the sum of $474,675, of which $274,675 remains to be appropriated.

The amount expended on the approved project to June 30, 1912, was $1,049,072.29, of which amount $29,682.37 was for maintenance during the past nine years. Prior to that time the amounts expended for works of improvement and for maintenance were so involved that it is impracticable to separate them.

Work is in progress under a contract dated June 19, 1911, for constructing shoreward and lakeward extensions of the west breakwaters, constructing a portion of the new east breakwater and removing a portion of the old east breakwater, and is now about 35 per cent completed. This work is being carried on under continuing contract authorizations aggregating $851,105, of which $274,675 is yet to be appropriated.

As a result of expenditures the depth across the bar at the mouth of the river has been increased to 21 feet and an outer harbor has been provided. A 20-foot channel extends up the river 1¾ miles above its mouth and is maintained by the local authorities.

Under arrangements with the Pittsburgh, Youngstown & Ashtabula Railroad Co. and the Lake Shore & Michigan Southern Railway Co., the inner piers have been replaced with bulkheads and the channel has been widened. Descriptions of this work are contained in the Annual Report of the Chief of Engineers for 1908, page 758, and that for 1909, page 795.

The project is regarded as about 46 per cent completed.

The water surface variations are similar to those at Cleveland.

All depths are referred to mean lake level 1860–1875, elevation 572.77 feet above mean tide at New York.

The commerce of Ashtabula Harbor for the calendar year 1911, amounted to 13,062,023 short tons, a decrease of 3,195,700 tons from that reported for the calendar year 1910.

There has been a marked reduction in freight rates since the project was inaugurated, but it is impracticable to determine how much of this reduction is due to this particular improvement.

The appropriation recommended will be applied to breakwater construction under the project of 1910.

The following examinations and surveys have been made in compliance with river and harbor acts from that of June 13, 1902: Preliminary examination of Ashtabula Harbor, Ohio, with a view to the extension of the easterly arm of the breakwater. See report of the Chief of Engineers for 1907, page 717, and House Document No. 86, Fifty-ninth Congress, second session (no map accompanying) preliminary examination and survey of Ashtabula Harbor, Ohio, with a view to enlarging and improving the outer harbor area. See report of the Chief of Engineers for 1910, page 879, and House Document No. 654, Sixty-first Congress, second session (with map).

July 1, 1911, balance unexpended		$503,249.30
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$223,252.00	
For maintenance of improvement	5.50	
		223,257.50
July 1, 1912, balance unexpended		279,991.80
July 1, 1912, outstanding liabilities		46,182.74
July 1, 1912, balance available		233,809.06
Amount appropriated by sundry civil act approved August 24, 1912		200,000.00
Amount available for fiscal year ending June 30, 1913		433,809.06
July 1, 1912, amount covered by uncompleted contracts		549,278.30
Amount of continuing contract authorization, act of February 27, 1911		474,675.00
Amount appropriated under such authorization		200,000.00
Amount yet to be appropriated		274,675.00
Amount (estimated) required to be appropriated for completion of existing project		[1] 709,096.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[1] 150,000.00

(See Appendix N N 9.)

10. Conneaut Harbor, Ohio.—This harbor comprises the lower 3,000 feet of Conneaut Creek and is located about 74 miles by water and 67 miles by rail easterly from Cleveland, Ohio. In its natural condition the creek was obstructed by a bar at its mouth, over which the average depth of water did not exceed 2 feet at ordinary lake level.

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[1] Exclusive of amount available for fiscal year 1913.

The first improvement was undertaken in 1829, and consisted in the construction of parallel jetties of timber cribs filled with stone. The greatest depth obtained under this project did not exceed 12 feet.

No appropriations were made for this harbor from 1880 to 1892. At the end of this period the jetties were in a decayed and dilapidated condition, and the channel had filled up with sand and silt and had practically reverted to its original condition. The harbor could only be used by small sailing craft such as were then engaged in fishing.

In 1892 a project was prepared which provided for the construction of parallel jetties 200 feet apart and extending outward to a depth of 17 feet in the lake, and appropriations under this project were made to 1896.

Expenditures on the early projects were $192,448.47.

A project was authorized by the river and harbor act of June 3, 1896, and is described in the Annual Report of the Chief of Engineers for 1896, pages 2970–2972, inclusive. This project provides for the completion of the jetties to a depth of 17 feet in the lake, and the construction of two detached breakwaters converging toward the lake and designed to shelter the entrance to the jettied channel, and for securing a navigable depth of 20 feet in the channel and sheltered area. The estimated cost of the work was $610,000, exclusive of maintenance.

The river and harbor act of June 25, 1910, appropriated $144,900 for maintenance and continuing improvement in accordance with the report contained in House Document No. 653, Sixty-first Congress, second session. This report includes plans for extensions to the east breakwater, a new west breakwater, the removal of portions of the existing west breakwater and east pier, and dredging in the outer harbor, all at an estimated cost of $1,338,681, with not to exceed $10,000 annually for maintenance.

The river and harbor act of February 27, 1911, appropriated $160,000 for continuing the improvement and authorized a contract or contracts not to exceed $120,738 additional for prosecution of the project of which $20,738 remains to be appropriated.

The existing project is therefore that of 1896, as modified and enlarged by the act of 1910.

The total amount expended on the existing project to June 30, 1912, was $842,824.33, of which amount $51,079.32 was for maintenance during the past nine years. Prior to that time the amounts expended for works of improvement and for maintenance were so involved that it is impracticable to separate them.

The work of protecting the east breakwater and extending it shoreward, under a contract dated September 6, 1910, was completed August 22, 1911. The work of constructing a portion of the lakeward extension of the east breakwater, a portion of the new west breakwater, and of removing a portion of the old west breakwater was commenced September 18, 1911, under a contract dated July 3, 1911. This work is now about 26 per cent completed. It is being carried on under a continuing-contract authorization aggregating $120,738, of which $20,738 is yet to be appropriated.

As a result of expenditures an entrance channel 21 feet deep and an outer harbor have been provided.

The modified project is regarded as about 43 per cent completed.

A 20-foot channel extends up the river 3,000 feet above its mouth and is maintained by local authorities.

The water-surface variations are similar to those at Cleveland.

All depths are referred to mean lake level 1860–1875, elevation 572.77 feet above mean tide at New York.

The commerce of Conneaut Harbor for the calendar year 1911 amounted to 8,879,277 short tons, an increase of 431,376 tons over that reported for the calendar year 1910.

There has been a marked reduction in freight rates since the project was inaugurated, but it is impracticable to determine how much of this reduction is due to this particular improvement.

For report on preliminary examination and survey of Conneaut Harbor, Ohio, with a view to enlarging and improving the outer harbor area, see Report of the Chief of Engineers for 1910, page 879, and House Document No. 653, Sixty-first Congress, second session (with map).

July 1, 1911, balance unexpended		$217,193.90
Amount refunded by Isthmian Canal Commission		1,847.38
		219,041.28
June 30, 1912, amount expended during fiscal year:		
For Isthmian Canal Commission	[1] $2,339.09	
For works of improvement	75,162.05	
For maintenance of improvement	680.00	
		78,181.14
July 1, 1912, balance unexpended		140,860.14
July 1, 1912, outstanding liabilities		28,907.24
July 1, 1912, balance available		111,952.90
Amount appropriated by sundry civil act approved Aug. 24, 1912		100,000.00
Amount available for fiscal year ending June 30, 1913		211,952.90
July 1, 1912, amount covered by uncompleted contracts		162,066.84
Amount of continuing contract authorization, act of Feb. 27, 1911		120,738.00
Amount appropriated under such authorization		100,000.00
Amount yet to be appropriated		20,738.00
Amount (estimated) required to be appropriated for completion of existing project		[2] 938,781.00

(See Appendix N N 10.)

11. Removing sunken vessels or craft obstructing or endangering navigation.—Schooner *Shawnee.*—On May 16, 1911, the schooner *Shawnee*, laden with coal, sunk behind and near the west breakwater, Cleveland Harbor. Her bow rests against the submerged spur 140 feet from the east end of the main west breakwater and her stern projects about 15 feet into the main entrance channel. Under date of June 28, 1911, the vessel was reported to the department as being abandoned by her owner and instructions were requested relative to the cargo. On July 5 the Chief of Engineers informed the district officer that both vessel and cargo should be taken possession of by the department under provisions of the law and that an allotment should be requested to effect removal of same. In accordance with these instructions an allotment of $1,500 was made from the indefinite appropriation for removing sunken vessels or craft obstructing or endangering navigation. It was proposed to remove the wreck by the use of U. S. dredge *Maumee*, but while proceeding from Sandusky in tow of tug *Spear* on October 4, 1911, for this purpose the *Maumee* was herself wrecked on the east breakwater, near the main entrance. Specifications are now being prepared for removal of the wreck by contract.

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[1] Of this amount, $1,317.28 is still to be refunded.

[2] Exclusive of amount available for fiscal year 1913.

(See Appendix N N 11.)

EXAMINATIONS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed as documents as indicated:

1. *Preliminary examination of Vermilion Harbor, Ohio, with a view to securing additional width of harbor entrance.*—Report dated August 20, 1910, is printed in House Document No. 283, Sixty-second Congress, second session. The improvement by the United States of this harbor in the manner desired is not deemed advisable at the present time.

2. *Preliminary examination of Maumee River from Toledo, Ohio, to Fort Wayne, Ind.*—Report dated October 31, 1911, with maps, is printed in House Document No. 769, Sixty-second Congress, second session. The improvement by the United States of this locality in the manner directed in the act is not deemed advisable at the present time, and that there is no authority at present for investigation by the Engineer Department in this connection of the through waterway from Lake Erie to Lake Michigan.

The local officer was also charged with the duty of making other preliminary examinations and surveys provided for by the river and harbor act approved June 25, 1910, as follows, and reports thereon will be duly submitted when received:

1. *Cuyahoga River, Ohio*, from its mouth to a more southerly connection with the Ohio Canal, with a view to eliminating bends and securing a navigable depth of 21 feet, with suitable width, with a report on any proposition for cooperation by localities affected thereby.

2. *Sandusky River, Ohio*, from its mouth to Fremont, with a view to securing a navigable depth of 10 feet, with suitable width.

IMPROVEMENT OF RIVERS AND HARBORS IN THE BUFFALO, N. Y., DISTRICT.

This district was in the charge of Col. J. G. Warren, Corps of Engineers. Division engineer, Col. C. McD. Townsend, Corps of Engineers.

1. *Harbor at Erie, Pa.*—On south shore of Lake Erie, in Presque Isle Bay, length from east to west 4½ miles, width from north to south 1 to 1½ miles; harbor basin 2 miles long, one-half to 1½ miles

wide, 18 to 24 feet deep. It is 80 miles by lake westerly from Buffalo Harbor, N. Y., and 99 miles by lake easterly from Cleveland Harbor, Ohio.

In its original condition the harbor was nearly landlocked, the only entrance being at the east end through a channel which was narrow and tortuous, variable in position, with a depth of about 6 feet.

The original project, approved March 26, 1824, for closing the eastern end of the harbor by means of a breakwater, in which there should be an opening 200 feet wide, and for extending, as required to keep them abreast of the 16-foot contour in the lake, two parallel piers, one on each side of the opening. The project also included the necessary work of dredging to keep the channel open, making the necessary repairs to existing structures and maintaining Presque Isle Peninsula.

A new project was adopted by the river and harbor act of March 3, 1899, requiring the harbor basin and entrance channel to be dredged to a depth of 20 feet at mean lake level, the north and south piers to be provided with concrete superstructure and extended 500 and 1,000 feet, respectively, and conditionally, as stated in House Document No. 70, Fifty-fifth Congress, first session, four protection jetties to be built along the outer shore of Presque Isle Peninsula.

The estimated cost of completing the project as stated above was $377,000.

The project was modified by approval of indorsement of June 17, 1907, of the Board of Engineers for Rivers and Harbors, and by the river and harbor act of June 25, 1910, to provide a depth of 20 feet available at all stages in the entrance channel and the east and west ends of the harbor basin, as designated in Rivers and Harbors Committee Document No. 26, Sixty-first Congress, second session; estimated cost, $75,625.

The amount expended on original project, prior to operations under existing project, was $841,867.43.

The existing project dated March 3, 1899, with modification included, is as follows: To protect Presque Isle Peninsula forming the harbor; to secure and protect the entrance channel 300 feet wide and 20 feet deep at low water between the harbor and Lake Erie by closing the eastern end of the harbor with a breakwater having an opening 300 feet wide, by extending parallel piers, one on each side of the opening to 16-foot contour in the lake, and by dredging; to deepen the entrance channel and the harbor basin by dredging at east end to 20 feet at low water (—21.7 feet at mean lake level), and the basin off public dock to 20 feet at mean lake level.

Report of preliminary examination with a view to extension of the piers is printed in House Document No. 394, Sixty-first Congress, second session; report of preliminary examination with a view to obtaining a depth of 22 feet and protecting Presque Isle Peninsula is printed in House Document No. 83, Sixtieth Congress, first session; reconsideration thereof in report of Board of Engineers for Rivers and Harbors in Rivers and Harbors Committee Document No. 26, Sixty-first Congress, second session.

The amount expended under this project to June 30, 1912, was $605,460.61. It is impracticable to separate the costs of construction and maintenance.

During the fiscal year surveillance of Presque Isle Peninsula and care of property was continued. Minor repairs were made to boathouse at a cost of $247.06. Specifications were prepared and approved for replacing 755 feet of timber superstructure on north pier with concrete, and proposals for the work will be invited early in the next fiscal year.

Project about 95 per cent completed. Remainder of project consists of pier extension from time to time, and building two jetties on Presque Isle Peninsula, provided for conditionally.

The maximum draft that could be carried June 30, 1912, at low lake level over the shoalest part of the locality under improvement was 20 feet, and the usual variation of level of water surface is about 2 feet. The following table gives the total arrivals and departures of vessels with their tonnage for the past 10 years:

Years.	Number.	Net tons.	Years.	Number.	Net tons.
1902	2,809	3,873,734	1907	2,927	5,504,896
1903	2,423	3,503,628	1908	2,098	3,690,578
1904	1,996	2,890,321	1909	2,473	3,960,351
1905	2,632	2,134,459	1910	2,330	3,910,081
1906	2,579	4,477,764	1911	2,048	3,464,896

The project is reported to have a material effect in controlling freight rates on bulk commodities, such as coal, grain, lumber, and ore.

No estimate of funds is made for the fiscal year ending June 30, 1914. Funds on hand are sufficient for ordinary maintenance during the fiscal year.

For more extended information and photographs, see Annual Report of the Chief of Engineers for 1900, pages 4100 et seq., and for 1903, pages 2115 et seq.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
General improvement	House	[1] 70	Fifty-fifth	First	[2] 1897	3237
Obtaining 22 feet depth and protect Presque Isle Peninsula.	do	[2] 88	Sixtieth	do		
Pier extension	do	[2] 394	Sixty-first	Second		
Deepening channel and basin	Committee	[2] 26	do	do		

[1] Contains maps.

[2] No maps.

A chart of Erie Harbor is issued in the series of charts of the Survey of the Northern and Northwestern Lakes, index 332, and index map faces page 2510, Annual Report Chief of Engineers for 1911.

July 1, 1911, balance unexpended	$86,721.86
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,167.62
July 1, 1912, balance unexpended	85,554.24

(See Appendix O O 1.)

2. *Harbor at Dunkirk, N. Y.*—This is a breakwater-protected harbor lying in an indentation of the south shore of Lake Erie between Point Gratiot on the west and Battery Point on the east. The distance between these points is 9,600 feet, and the maximum breadth of the indentation is 3,600 feet. The harbor basin is 2,400 feet long, 1,000 feet wide, 16 to 18 feet deep; entrance channel is 1,500 feet long, 200 feet wide, project depth 18 feet. This harbor is 36 miles by lake westerly from Buffalo Harbor, N. Y., and 44 miles by lake easterly from Erie Harbor, Pa.

The original depth of water was about 10 feet at mean lake level and 15 to 16 feet to underlying rock.

The project, approved November 30, 1870, provided for a detached breakwater 2,860 feet long, one part of which, 2,300 feet long, was to be nearly parallel to the shore; the other part, 560 feet long, to be nearly parallel with the axis of the entrance channel.

This breakwater and the pier already built, 1,410 feet long, were to form the harbor, and the old channel was to be enlarged to 170 feet wide and 13 feet deep.

The project adopted by Congress and provided for by the river and harbor act of June 3, 1896, consisted in completing the breakwater, as before planned, by the addition of 360 feet to its eastern end and adding the channel arm, 560 feet long, and in addition thereto dredging the entrance channel and a harbor basin, containing in all about 65 acres, to a depth at mean lake level suitable for vessels drawing 16 feet. This work was completed in 1898 at a total cost of $389,060.55.

The project was modified by the river and harbor act of June 25, 1910, to provide for the removal of a rocky reef bordering on the inner entrance channel to a depth of 18 feet at mean lake level, as designated in House Document No. 720, Sixty-first Congress, second session, at an estimated cost of $99,275, which amount was appropriated by the act, but the expenditure of which was made contingent upon local authorities constructing a suitable concrete dock, or providing such other terminal facilities as might be approved by the Secretary of War.

At the close of the fiscal year arrangements and plans were in progress, but the conditions had not yet been complied with.

The amount expended on original project prior to operations under existing project was $551,579.38.

The existing project, dated June 3, 1896, with modifications to date, is as follows:

To maintain existing structures built under previous projects; to excavate and maintain an entrance channel 200 feet wide and a harbor basin, containing about 65 acres, to a depth suitable for vessels of 16 feet draft; and to remove rock reef bordering inner channel conditionally, as designated in House Document No. 720, Sixty-first Congress, second session.

For reports of surveys, see page 3127, Annual Report of the Chief of Engineers for 1896; and page 4150, Annual Report of the Chief of Engineers for 1900; and House Document No. 720, Sixty-first Congress, second session. Reference to report on preliminary examination will be found on page 770 of report for 1908, printed in House Document No. 81, Sixty-first Congress, first session.

No work was done during the fiscal year.

The amount expended under existing project to June 30, 1912, was $436,267.18. It is impracticable to separate the costs of construction and maintenance.

The project is completed, except maintenance and removal of rock reef.

The maximum draft that could be carried June 30, 1912, at mean lake level, over the shoalest part of the locality under improvement was 14 feet, and the usual variation of level of water surface is about 2 feet.

Freight rates have not been affected by the project.

The following table gives the total arrivals and departures, with their tonnage, for the past 10 years:

Years.	Number.	Net tons.	Years.	Number.	Net tons.
1902	148	33,435	1907	97	5,712
1903	237	64,808	1908	117	3,422
1904	117	5,128	1909	72	1,196
1905	115	9,502	1910	76	2,381
1906	111	11,810	1911	108	5,878

For more extended information and map, see Annual Report of the Chief of Engineers for 1898, pages 2748 et seq.

A chart of Dunkirk Harbor is issued in the series of charts of the Survey of the Northern and Northwestern Lakes, index 318.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Channel, basin, and breakwater	House	[1] 63	Fifty-fourth	First	1896 [2]	3127
East breakwater	do	[1] 74	Fifty-sixth	do	1900 [2]	4148
Further improvement	do	[2] 81	Sixtieth	do		
Channel	do	[1] 720	do	do		

[1] Contains maps.

[2] No maps.

Funds on hand are sufficient for ordinary maintenance during the fiscal year ending June 30, 1914, and no appropriation of funds is therefore recommended.

July 1, 1911, balance unexpended	$101, 645. 82
Amount received from sales	42. 50
July 1, 1912, balance unexpended	101, 688. 32

(See Appendix O O 2.)

3. Harbor at Buffalo, N. Y.—The outer harbor is about 4½ miles long and 1,600 feet wide and the inner river and canal and basin harbor about 7 miles long and 200 feet wide; project depth, 23 feet at mean lake level. Buffalo Creek was the original harbor of the port of Buffalo. In its original condition the entrance channel from the lake was shallow and frequently closed by a gravel bar. The original project for the improvement of this harbor was adopted in 1826, and provided at first for the maintenance of and additional construction on piers on the north and south sides of Buffalo Creek, originally constructed by citizens of Buffalo, aided with funds by the State of New York. Subsequently a masonry sea wall 5,400 feet long was built along the lake shore south of the harbor entrance and a sand-catch pier of piles and stones 879 feet long built out from the shore.

Between 1868 and 1893 a detached breakwater 7,600 feet long was built of timber cribs about ahalf mile distant from the lake shore and parallel with it.

A shore arm about 4,000 feet long was projected in 1874, to extend lakeward from the sand-catch pier to the line of this breakwater, leaving an opening of 150 feet. Work on this was in progress when it was wrecked by storm in 1893.

A new project was adopted in 1895 on the recommendation of a board of engineer officers, and consisted of the abandonment of the shore arm and the extension of the breakwater to Stony Point.

The report of the board and details of its plans are published in the Annual Report of the Chief of Engineers for 1895, page 3153 et seq. The river and harbor act of June 3, 1896, added to the project of the board by providing for the construction of a farther length of the sand-catch pier, extending it to the established pierhead line.

The river and harbor acts of June 6, 1900, and June 13, 1902, made special provision for deepening the entrance to Buffalo Harbor and the city ship canal.

The river and harbor act of March 2, 1907, made special provisions for dredging at the entrance to canals at south end of the outer harbor to 23 feet depth, and for excavating rock shoals outside of the north entrance.

The river and harbor act of June 25, 1910, made special provision for further removal of shoals outside north harbor entrance and for the removal of the Watson elevator site on certain conditions, at estimated cost of $37,400 and $62,205, respectively, and the river and harbor act of February 27, 1911, provided that $15,000, or so much thereof as may be necessary, from funds previously appropriated, may be applied to the completion of the Stony Point breakwater.

The amount expended on original project prior to operations under existing project was $2,837,995.37.

The existing project, dated June 3, 1896, with modifications to date, is as follows:

(*a*) To build an extension of the breakwater to Stony Point, leaving the necessary openings for the convenience of commerce.

(*b*) To extend the sand-catch pier to the established pierhead line.

(*c*) To build an arm 1,000 feet long to the Stony Point section of breakwater for the purpose of protecting the south harbor entrance.

(*d*) To maintain existing structures by strengthening timber-crib concrete portions and by making repairs and replacing the wooden superstructure of the breakwater with concrete and stone when necessary, and to maintain the north entrance channel 23 feet deep at mean lake level.

(*e*) To dredge to a depth of 23 feet at mean lake level an area at south end of harbor sufficient to provide access to canals of Lackawanna Steel Co. and Buffalo & Susquehanna Iron Co.

(*f*) To remove to a depth of 23 feet a shoal outside the main or north entrance to harbor.

(*g*) Removal of additional shoals outside north entrance to harbor.

(*h*) Removal of Watson elevator site.

Of the above items (*a*), (*b*), (*c*), (*e*), and (*f*) have been completed, (*d*) will be required indefinitely, and (*g*) and (*h*) are in progress, to be completed during the season of 1913.

The amount expended to June 30, 1912, was $5,752,028.94, of which $2,914,033.57 has been expended on existing project. It is impracticable to separate the costs of construction and maintenance.

During the fiscal year minor repairs were made on the breakwater and contract was made and work was commenced upon removal of the Watson elevator site, and of additional shoals outside north entrance to harbor, and for dredging the north entrance channel. At the close of the fiscal year work had been fairly started on all of the three items.

For reports of surveys, see page 3152, Report of Chief of Engineers for 1895, House Document No. 35, Fifty-eighth Congress, second session; House Document No. 240, Fifty-ninth Congress, first session; House Document No. 298, Sixty-first Congress, second session; and House Document No. 550, Sixty-second Congress, second session. For report of preliminary examination with a view to widening and improving the entrance to Erie Basin, see House Document No. 327, Sixty-first Congress, second session.

The maximum draft that could be carried June 30, 1912, at mean lake level over the shoalest part of the locality under improvement was 20 feet. The usual variation of level of water surface is 3 feet, with maximum variation, by gales, of 5 feet below and 6½ feet above mean lake level.

A good harbor has been obtained. The principal harbor works are the north and south piers and the north entrance channel between them at the mouth of Buffalo Creek, in which most of the business of the port is done, and the outer breakwater system, consisting of four sections of breakwater, of an aggregate length of 23,600 feet, inclosing an outer harbor 4½ miles long and over one-half mile wide. This breakwater system comprises 8,894 linear feet of breakwater of timber-crib-concrete type, 8,250 linear feet of stone or rubble-mound type, 2,633 feet of timber-crib-stone type, and 3,823 feet of timber-crib type.

The entrance channel has been dredged 23 feet deep at mean lake level for a width of 200 to 300 feet for 2,200 feet outward from outer end of north pier, 150 feet wide between the piers to its inner end (junction of Buffalo River and city ship canal), except over an area of rock at that point, where the depth is from 21¼ to 23 feet.

Dredging is in progress, under contract, to increase the width to 400 feet outward from the outer end of the south pier, to increase depth over the rock area to 23 feet, and to redredge the channel where necessary.

The outer harbor has an area of about 680 acres; over 570 acres of the area the depth of water is 19 to 30 feet at mean lake level; and over the remainder, along the harbor line, the depth is 15 to 19 feet.

The South Harbor entrance is over 28 feet deep. The North Harbor entrance has controlling depth of 21.7 feet at mean lake level in a 400-foot channelway over rock reef outside of the breakwater.

In addition to providing a safe place of refuse and anchorage it is used as a channelway by lake vessels entering at the north entrance and bound for the Lackawanna Steel Co., the Buffalo & Susquehanna Iron Co., and the Pennsylvania Railroad Co., ore docks at the south end of the harbor; also by vessels entering at the south entrance, bound for the Buffalo River or inner harbor. Such use by the largest and deepest draft vessels on the Lakes is extensive, but under present conditions the depth of water is not adequate for safe unobstructed navigation and for the maneuvering of deep-draft vessels going to or leaving anchorage or moorings. The adequate depth required is 20 feet at all stages of water level; and to secure this depth at low water, which occurs annually after September, a depth of 23 feet at mean lake level is required.

The deepening of the outer harbor and the north entrance thereto was the subject of a preliminary examination and survey; and report thereon is printed in House Document No. 550, Sixty-second Congress, second session. The river and harbor act approved July 25, 1912, adopted the project presented in this document, which contemplates securing an available depth of 23 feet at mean lake level in the outer harbor over the areas designated A and B on map accompanying said document, and depths of 23 and 25 feet, respectively, over the areas designated D and C at the north entrance, at an estimated cost of $624,750 for first construction, with $1,000 annually for maintenance. The first appropriation recommended, $290,000, was made by the act.

For more extended information and maps and photographs see annual reports of the Chief of Engineers since 1897.

The commerce of Buffalo is large. During the year 1911 there were 6,487 arrivals and departures of vessels by lake and river, with 12,417,862 short tons of freight.

The arrivals and departures of canal boats by the Erie Canal were 2,968, with 1,291,418 short tons of freight.

The principal receipts by lake and river were wheat, corn, flour, oats, iron ore, lumber, copper, pig iron, glucose, lard, and pork. The total receipts amounted to 7,641,841 short tons.

The shipments by lake were principally coal, sugar, salt, manufactured iron, and cement, and aggregated 4,776,021 short tons.

For comparison the following table is given, showing the arrivals and departures by lake and canal and the freight tonnage for the past five years:

Years.	Lake.		Canal.	
	Number.	Short tons.	Number.	Short tons.
1907	8,205	16,487,240	5,014	1,942,465
1908	6,191	12,178,874	4,482	1,021,527
1909	6,659	14,145,013	4,230	1,568,615
1910	7,137	14,755,717	4,124	1,534,706
1911	6,487	12,417,862	2,968	1,291,418

Total shipments and receipts: 1910, 16,290,423 short tons; 1911, 13,709,280 short tons.

The project is reported to have a material effect in controlling freight rates on bulk commodities such as coal, grain, lumber, and ore.

A chart of Buffalo Harbor is issued in the series of charts of the survey of the Northern and Northwestern Lakes, Index 312, and index map faces page 2514, Annual Report of the Chief of Engineers for 1911.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Part.	Page.
General improvement [1]	Senate (committee doc.).	154	Fifty-first	First	....	2,3	....
North Breakwater	House	[2] 72	Fifty fifth	do	1897 [1]	......	3245
Entrance to Black Rock Harbor.	do	[2] 125	Fifty-sixth	Second	1901 [1]	......	3342
Erie Basin	do	[1] 36	Fifty-eighth	do	1905 [1]	......	3152
Breakwater and South Entrance Breakwater Arm.	do	[2] 240	Fifty-ninth	First	....	......	....
North entrance channel	do	[2] 298	Sixty-first	Second	....	......	....
Removal Watson elevator site.	House (committee doc.).	[1] 2	do	do	....	......	....
Erie Basin entrance	House	[2] 327	do	do	....	......	....
Outer harbor	do	[2] 550	Sixty-second	do	....	......	....

[1] No maps. [2] Contains maps.

Funds on hand are sufficient for ordinary maintenance during the fiscal year ending June 30, 1914, and no appropriation of funds therefor is recommended.

For improvement under the new project adopted in the river and harbor act of 1912, a succeeding annual appropriation of $167,375, in accordance with House Document No. 550, Sixty-second Congress, second session, is recommended.

July 1, 1911 balance unexpended		$202,032.58
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$17,639.49	
For maintenance of improvement	5,726.07	
		23,365.56
July 1, 1912, balance unexpended		178,667.02
Amount appropriated by river and harbor act approved July 25, 1912		290,000.00
Amount available for fiscal year ending June 30, 1913		468,667.02
July 1, 1912, amount covered by uncompleted contracts		81,925.40
Amount (estimated) required to be appropriated for completion of existing project		[1] 334,750.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[1] 167,375.00

(See Appendix O O 3.)

4. *Black Rock Harbor and Channel, N. Y.*—Black Rock Harbor is in reality a canal built along the east bank of Niagara River, separated therefrom by Bird Island Pier and Squaw Island, which form the dam, and having at its lower end a lock of 5 feet lift, 36 feet wide by 200 feet long, and a depth of 9½ feet on miter sills at mean lake

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[1] Exclusive of amount available for fiscal year 1913.

level. This harbor or canal was separated from the Erie Canal by a wall of stone and earth, and was constructed as a terminal for the Erie Canal. It is 4 miles long and from 200 to 400 feet wide.

From 1829 to 1834 appropriations amounting to $52,098 were made by the United States and applied to the construction of the Bird Island Pier.

The object of the present project is to provide a channel for deep-draft vessels between Buffalo and Tonawanda around the rapids at the head of Niagara River. This is to be accomplished by making a channel 200 feet wide and 23 feet at mean lake level, joining, at the foot of Maryland Street, Buffalo, the 23-foot channel completed in 1908, the proposed channel to extend westerly and northerly, through Black Rock Harbor and Erie Canal combined, to the present lock, below which a ship lock of the requisite capacity is to be built, the channel to extend from the foot of the ship lock through the Niagara River for a distance of about 2½ miles to deep water above Tonawanda, 400 feet wide and 23 feet deep at mean river level. The estimated cost is $4,500,000. The original project contemplated a lock 600 feet in length and 60 feet in width between quoins; but in order to accommodate vessels of the largest size now in use and under construction which may desire to use it, the dimensions of the lock were increased to 650 feet in length and 70 feet in width, under authority of the river and harbor act of March 2, 1907.

Report of survey is printed on page 3284 et seq. of report for 1904.

Lands and structures needed in the prosecution of the work were granted to the United States by the State of New York by letters patent, dated July 25, 1905.

The amount expended on original project prior to operations under existing project was $52,098.

Continuing contracts were authorized by the river and harbor acts of March 3, 1905, March 2, 1907, March 4, 1909, June 25, 1910, and February 27, 1911, in the sum of $4,400,000, which amount is expected to complete the work. This has all been appropriated except $300,000, and contracts have been made as follows:

(*a*) For the excavation of the southerly 6,400 feet, more or less, of the channel, to be completed December 31, 1908; completed.

(*b*) For the excavation of the next northerly 3,400 feet, more or less, to Ferry Street Bridge, of the channel; completed.

(*c*) For the construction of concrete walls for ship lock; completed.

(*d*) For the construction and erection of steel lock gates, valves, and operating machinery for ship lock; completed.

(*e*) For the excavation of the channel in Niagara River below the ship lock, to be completed June 30, 1912. Time limit waived.

(*f*) For the widening of the channel to 200 feet and construction of new pier at the elbow in Bird Island Pier opposite Fort Porter; completed.

(*g*) For the excavation of the channel from Ferry Street to the ship lock (the last section to be excavated), including the removal of the old lock and the Ferry Street Bridge pier to be completed December 31, 1912.

(*h*) For removal of cofferdam at ship lock and purchase of extracted steel sheet piling; to be completed December 31, 1912.

(*i*) For construction of wing walls at ship lock; to be completed December 1, 1913.

(*j*) For construction of bridge across Black Rock Harbor at foot of Ferry Street, Buffalo, N. Y.; to be completed June 30, 1913.

The total amount expended to June 30, 1912, was $2,810,953.60, all for works of improvement, of which $2,758,855.60 has been expended on existing project. The project is about 80 per cent completed.

During the fiscal year channel excavation and lock construction were continued under contracts, and at its close (*a*), (*b*), (*c*), (*d*), and (*f*) were wholly completed; (*e*) was 90 per cent completed; (*g*) was 35 per cent completed; and (*h*), (*i*), and (*j*), for which contracts were made in the spring of 1912, were well under way.

Specifications for furnishing and installing electric power and light lines and fixtures, telephone wiring, and iron fences with gates were completed, and it is expected to begin that work, under contract, in August, 1912.

The maximum draft that could be carried June 30, 1912, at mean lake level, over the shoalest part of the locality under improvement, was 8 feet, and the usual variation of water surface is 3 feet.

The project being auxiliary to the improvement at Buffalo, has not, as a separate work, affected freight rates.

The locality is shown on United States Lake Survey Chart No. 312, and index map faces pages 2520, Annual Report of the Chief of Engineers for 1911.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
North breakwater	House	[1] 72	Fifty-fifth	First	1897 [2]	3245
Entrance to Black Rock Harbor	do	[1] 125	Fifty-sixth	Second	1901 [2]	3342
Channel and lock	do	[2] 428	Fifty-eighth	do	1904 [2]	3271
Do	House committee.	[2] 36	Sixty-first	do		
Distribution of expense	House	[1] 918	Fifty-ninth	First		

[1] Contains maps.

[2] No maps.

For commercial statistics see report on Buffalo Harbor and on Tonawanda Harbor and Niagara River, N. Y.

Further work under the project is the completion of lock grounds and buildings and general repair of Bird Island Pier.

In order to advance this work most advantageously and complete the project it is recommended that the $300,000, authorized by the river and harbor act of February 27, 1911, be appropriated for the fiscal year ending June 30, 1914.

July 1, 1911, balance unexpended	$1,900,800.95
June 30, 1912, amount expended during fiscal year, for works of improvement	559,334.30
July 1, 1912, balance unexpended	**1,341,466.65**

July 1, 1912, amount covered by uncompleted contracts	$756,436.19
Amount of continuing contract authorization, act of Feb. 27, 1911	300,000.00
Amount yet to be appropriated	300,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1]300,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1]300,000.00

(See Appendix O O 4.)

5. Tonawanda Harbor and Niagara River, N. Y.—In its original condition the navigation of Niagara River from Lake Erie to Tonawanda was obstructed by several reefs and shoals, which materially limited the draft of vessels traversing it. The water in the harbor between Tonawanda Island and the mainland was shoal.

The adopted project of April 11, 1888, as modified June 3, 1896, and June 13, 1902, is the existing project, and is to remove obstructions so as to make a channel 400 feet wide and 18 feet deep at mean river level from Lake Erie to the north line of North Tonawanda, a distance of 14 miles, including the dredging of Tonawanda Harbor and Tonawanda Creek up to the State dam, to a depth of 18 feet.

The river and harbor act of March 2, 1907, also appropriated $3,000 for removing wreck of steamer *Embury* from Niagara River, near Grand Island.

The project is completed, except that about one-fourth mile of channel at the Buffalo waterworks intake pier, where the river currents are very swift and the width of the channel is about 100 feet, and from the Tonawanda Iron & Steel Co.'s dock to the north line of North Tonawanda, 1½ miles, where the depth is from 12 to 15 feet. Improvement at these localities is not urgent and has therefore not been done.

The amount expended to June 30, 1912, was $661,671.45, all for improvement.

No work was done and no money expended during the fiscal year.

No work is proposed for the ensuing fiscal year.

The commerce of Tonawanda is large. During the year 1911 there were entered and cleared 1,100 lake vessels, with a registered tonnage of 778,600 tons. The receipts were principally lumber, iron ore, and limestone, and aggregated 1,104,392 tons. The shipments from Tonawanda are entirely by Erie Canal.

The maximum draft that could be carried June 30, 1912, at mean lake level, over the shoalest part of the locality under improvement, was 15 feet, and the usual variation of level of water surface is 2 feet.

A chart of Niagara River to the Falls is issued in the series of Charts of Northern and Northwestern Lakes, Index 312.

It is reported that the project has a material effect in controlling freight rates on bulk commodities, such as coal, grain, lumber, and ore.

Report of preliminary examination, under provision of the river and harbor act of June 25, 1910, is printed in House Document No. 286, Sixty-second Congress, second session.

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[1] Exclusive of the balance unexpended July 1, 1912.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
16-foot channel	House	[1] 83	Fiftieth	First	1888 [1]	2066
Tonawanda Creek	do	[2] 143	Fifty-sixth	do	1900 [1]	4155

[1] No maps.

[2] Contains maps.

Funds on hand are sufficient for ordinary maintenance during the fiscal year ending June 30, 1914, and no appropriation of funds is therefore recommended.

July 1, 1911, balance unexpended	$30,272.45
July 1, 1912, balance unexpended	30,272.45

(See Appendix O O 5.)

6. Niagara River, N. Y.—This improvement is a part of that formerly carried on under the title "Niagara River from Tonawanda to Port Day, N. Y.," or to the city of Niagara Falls, N. Y.

The work done by the General Government on the improvement of the Niagara River between Tonawanda and Niagara Falls was under a project adopted in 1894, which provided for a channel 200 feet wide and 12 feet deep from Tonawanda to Schlossers Dock, foot of Sugar Street, which is located about 2,000 feet above Gill Creek and is the port of the city of Niagara Falls. The total length of the part under improvement is 6 miles. The improvement required a cut through two shoals, one a short distance above Conners Island and Schlossers Dock and the other about halfway between Cayuga Island and Tonawanda; also the removal of scattered bowlders above Cayuga Island. The Conners Island cut was completed, but the Cayuga Island cut, through rock, was not excavated to full width, the work having been stopped in December, 1900, when funds were exhausted.

The river and harbor act of June 25, 1910, provided for completion of the channel across Cayuga Island Shoal to a width of 200 feet and depth of 12 feet at mean river level, at a cost of $10,000, in accordance with plan printed in House Document No. 75, Sixtieth Congress, first session. The work was completed during the fiscal year.

The amount expended to June 30, 1912, was $68,507.24, all for works of improvement.

The maximum draft that could be carried June 30, 1912, at mean river level over the shoalest part of the locality under improvement was 12 feet, and the usual variation of level of water surface is 2 feet.

The river and harbor act approved July 25, 1912, adopted a new project in accordance with report printed in House Document No. 549, Sixty-second Congress, second session, which contemplates securing an available harbor or channel depth of 14 feet and a channel width of 400 feet in section II shown on map attached to the said document; and 300 feet in section III, at an estimated cost of $55,125 for first construction, with $1,000 annually for maintenance, subject to the condition that local interests contribute 50 per cent of the cost of construction work, or $27,562.50. The act made an appropriation of $27,562.50 for the portion of the project to be accomplished by the United States.

The commerce involved in the improvement is very small. During the year no arrivals and departures of freight or excursion boats at Sugar Street (Schlossers) Dock were reported by the collector of customs. Whatever benefit the work confers will be upon future commerce.

The freight business using the channel consists of raw materials carried on canal boats of 6 to 8 feet draft, towed by tugs from the Erie Canal at Tonawanda to Schlossers Dock. The extent of this business for past years is shown in the following table, compiled from Annual Reports of the Chief of Engineers and reports received from the collector of customs, Niagara Falls, N. Y.:

Freight received at Sugar Street (Schlossers) Dock, via Niagara River Channel, from Tonawanda.

Rosin, potash clay, sulphur, nitrates, rock, etc.:	Short tons.
1899	1,410
1900	1,517
1901	1,579
1902	135
1903	3,095
1904 to 1911	None.

It is probable that the constantly increasing manufacturing interests at Niagara Falls and the construction of the New York State barge canal will in time develop a greater traffic by river. The existing 12-foot channel, completed as herein provided, will be of the same depth as the barge canal and meet all requirements for canal-barge navigation.

For more extended information, see Annual Report of the Chief of Engineers for 1900, page 4144 et seq.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Port Day Harbor	House	[1] 58	Forty-sixth	Third	1881 [1]	[illegible]
Tonawanda-Gill Creek	do	[2] 75	Sixtieth	First		
18-foot channel	do	[2] 286	Sixty-second	Second		
14-foot channel	do	[1] 549	do	do		

[1] Contains maps.

[2] No maps.

The locality is shown on the chart Buffalo Harbor and Niagara River to the Falls, survey of the Northern and Northwestern Lakes, index No. 312.

No appropriation is recommended.

July 1, 1911, balance unexpended	$9,864.70
June 30, 1912, amount expended during fiscal year, for works of improvement	8,371.94
July 1, 1912, balance unexpended	1,492.76
Amount appropriated by river and harbor act approved July 25, 1912	27,562.50
Amount available for fiscal year ending June 30, 1913	29,055.26

(See Appendix O O 6.)

7. Removing sunken vessels or craft obstructing or endangering navigation.—The steel steamer *W. C. Richardson*, en route from upper lake ports to Buffalo, foundered in Lake Erie, 1⅝ miles outside Buffalo Breakwater, on the night of December 8, 1909.

The wreck was abandoned by the underwriters on May 16, 1912, after several attempts had been made to raise it.

Under an allotment of $50,000 from the indefinite appropriation, preparations were made for its removal by the United States. Bids were opened on June 29, 1912, the lowest received being $1,000 for entire removal. Contract not yet made.

The amount expended to June 30, 1912, was $56.11 for preparatory work.

(See Appendix O O 7.)

EXAMINATIONS AND SURVEY MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and survey required by the river and harbor act of June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. Preliminary examination of Niagara River, N. Y., with a view to securing a depth of 18 feet from Black Rock Harbor to the foot of Sugar Street, Niagara Falls, N. Y.—Reports dated October 17, 1910, and January 23, 1911, are printed in House Document No. 286, Sixty-second Congress, second session. The improvement of this locality by the United States is not deemed advisable at the present time.

2. Examination and survey of Buffalo Harbor, N. Y., with a view to securing increased depth in the outer harbor and entrance thereto.—Reports dated October 20, 1910, and June 10, 1911, with map, are printed in House Document No. 550, Sixty-second Congress, second session. A plan of improvement, at an estimated cost of $624,750 for first construction, and $1,000 annually for maintenance, is presented.

EXAMINATION AND SURVEY MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Reports dated May 20 and December 2, 1911, with map, on preliminary examination and survey, respectively, of *Niagara River, N. Y., with a view to securing a depth of 14 feet in the channel between Navy and Grand Islands leading to the foot of Sugar street, in the city of Niagara Falls*, required by the river and harbor act approved February 27, 1911, were duly submitted by the district officer.

They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 549, Sixty-second Congress, second session. A plan of improvement, at an estimated cost of $55,125 for first construction, with $1,000 annually for maintenance, subject to certain specified local cooperation, is presented.

The local officer was also charged with the duty of making a preliminary examination and survey, provided for in the river and harbor act approved February 27, 1911, of a *deep-water connection with suitable terminals that may be established at North Tonawanda at the head of the New York State Barge Canal, N. Y.*, and reports thereon will be duly submitted when received.

IMPROVEMENT OF RIVERS AND HARBORS IN THE OSWEGO, N. Y., DISTRICT.

This district was in the charge of Col. J. G. Warren, Corps of Engineers. Division engineer, Col. C. McD. Townsend, Corps of Engineers.

1. Harbor at Olcott, N. Y.—This harbor is a pier-protected channel way 850 feet long to a pool in the mouth of Eighteen Mile Creek, Lake Ontario, 600 feet long and 98 to 180 feet wide 18 miles east of the mouth of the Niagara River. In its original condition there was a depth of 3 feet on the bar.

The original project, adopted in 1867, provided for a channel 11 feet deep and 150 feet wide between parallel piers about 200 feet apart. The piers were built—east pier 850 feet and west pier 873 feet long—and the channel dredged 11 feet deep. In 1891 a new project was adopted, calling for a depth of 13½ feet from the Main Street Bridge to deep water in the lake. The adopted plane of reference is mean level of Lake Ontario, 2.4 feet above low water (zero of the Oswego gauge). The width of the channel of the project is 180 feet between the piers, narrowing to 98 feet at Main Street Bridge.

The project is completed except for maintenance.

The piers are in need of extensive repairs, and the channel fills in rapidly and requires dredging annually to maintain the required depth.

The amount expended to June 30, 1912, was $179,167.55. It is impracticable to separate the cost of construction and maintenance.

Olcott Harbor was dropped from the list of improvements in 1906.

Subsequent to report on preliminary examination, dated March 28, 1911, and of special examination of the harbor works, May 23, 1911, an allotment of $1,500 was made June 8, 1911, for emergency repairs to the piers.

During the fiscal year the emergency repairs were made on both piers at a cost of $1,180.68, and the balance of the allotment returned to the Treasury.

The maximum draft that could be carried June 30, 1912, over the shoalest part of the improvement was 10 feet at low water. The usual variation of level of water surface is 3 feet.

The commerce of Olcott is small and is not increasing.

Freight rates have not been affected by the project.

The following is a statement of the commerce of this port for the years given, in short tons: 1903, 1,760 tons; 1904, none; 1905, 634 tons; 1906, 500 tons; 1907, none; 1908, 245 tons; 1909, none; 1910, none; 1911, 3 tons.

Summer excursion passenger traffic increased from 5,000 in 1903 to 60,000 in 1911.

Reports of preliminary examinations and surveys are printed in Annual Report of the Chief of Engineers for 1904, page 3534 et seq. (H. Doc. No. 232, 58th Cong., 2d sess.), and in House Document No. 780, Sixty-second Congress, second session.

For more extended information and map, see Annual Report of the Chief of Engineers for 1891, page 2893 et seq.

No appropriation is recommended.

July 1, 1911, balance unexpended	$1,500.00
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,180.68
Returned to Treasury to credit of emergency appropriation act of March 3, 1905	319.32

(See Appendix P P 1.)

2. *Harbor at Charlotte, N. Y.*—This harbor is on Lake Ontario at the mouth of the Genesee River, about 7 miles below Rochester, N. Y. It is 77 miles east of the mouth of the Niagara River and 59 miles west of Oswego Harbor.

The pool at the mouth of the river is about 5 miles long and from 150 to 250 feet wide, pier-protected entrance channel 4,000 feet long, 200 to 150 feet wide.

In its original condition vessels of more than 8 feet draft could not cross the bar between the lake and pool.

The original project of 1829 was to secure a channel 12 feet deep across the bar by constructing parallel piers to confine and direct the action of the spring freshets. The project of 1882 was to obtain a depth of 15 feet by extending the two piers a total of 3,250 feet and by dredging. After the piers had been extended 1,444 feet the project was modified, July 18, 1896, to preserve the depth by dredging, without further extension of the piers for the present, and March 2, 1897, it was again modified to obtain and maintain not less than 16 feet and not more than 16½ feet at low water (zero of Oswego gauge) in a channel not more than 200 feet wide.

By the river and harbor act of June 25, 1910, the project was further modified, in accordance with plan printed in House Document No. 342, Sixty-first Congress, second session, so as to obtain a depth of 20 feet below low water, zero of the Oswego gauge, which is 244.12 feet above mean tide at New York City, so as to be at all times available for use by vessels drawing 18 feet, at an estimated cost of $41,800.

The amount expended on original project, prior to operations under existing project, was $521,328.40.

The existing project, adopted 1882, with modifications to date, is to obtain and maintain a channel of 20 feet depth at low water (zero of the Oswego gauge) 150 to 200 feet wide and to maintain the piers, without further extension for the present.

The piers are nearly parallel, about 450 feet apart. The west pier is 3,616 feet and the east pier is 3,109 feet in length, projecting beyond the shore line 2,230 and 2,200 feet, respectively. One thousand five hundred and thirty-two feet of east pier and 1,799 feet of west pier have been rebuilt with concrete superstructure. The dredging of the entrance channel to the new project depth was in progress under contract during the fiscal year; 60 per cent completed.

The replacing of old timber superstructure on piers with concrete by day labor and United States plant was continued during the fiscal year.

The total amount expended to June 30, 1912, was $799,007.13. It is impossible to separate the cost of construction and maintenance.

June 30, 1912, the maximum draft that could be carried in the channel at low water was 15 feet, and the usual variation of water surface is 3 feet.

The Genesee River is navigable for lake vessels for a distance of about 2½ miles above its mouth.

It is reported that the project has a material effect in controlling freight rates on bulk commodities, such as coal, grain, lumber, and ore.

The following is a statement of the commerce at this port during the past 10 years, in short tons: 1902, 557,690; 1903, 569,169; 1904, 554,212; 1905, 597,996; 1906, 432,709; 1907, 701,916; 1908, 709,950; 1909, 873,337; 1910, 973,233; 1911, 940,472.

For more extended information and map, see Annual Report of the Chief of Engineers for 1894, page 2455 et seq.

Report of preliminary examination and survey is printed in House Document No. 342, Sixty-first Congress, second session.

A chart of Charlotte Harbor is issued in the series of charts of the survey of the Northern and Northwestern Lakes, index 241.

The work proposed for the fiscal year ending June 30, 1914, is necessary repairs to and the continuation of reconstruction of piers with concrete superstructure and dredging of the channel to maintain the navigable depth of 18 feet at low water. Funds on hand are sufficient for this work, and no appropriation is therefore recommended.

July 1, 1911, balance unexpended	$117,217.12
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	33,882.99
July 1, 1912, balance unexpended	83,334.13
July 1, 1912, outstanding liabilities	57.86
July 1, 1912, balance available	83,276.27
July 1, 1912, amount covered by uncompleted contracts	20,026.36

(See Appendix P P 2.)

3. Harbor at Pultneyville, N. Y.—This harbor is at the mouth of Salmon Creek, which empties into Lake Ontario in Wayne County, N. Y., 22 miles east of Charlotte Harbor.

The pool at the mouth of the creek is about 900 feet long and from 40 to 60 feet wide; pier-protected entrance channel, 700 feet long, 200 feet wide, 10 feet deep.

The original project in 1871 was to protect the approach to the creek by building two piers in the lake of timber cribs filled with stone and to dredge a channel from the 10-foot curve in the lake to the mouth of the creek to a depth of 10 feet at low water, at an estimated cost of $59,000.

In 1875 the material to be dredged was found to be so hard that the estimated cost was increased to $71,000.

The project is completed, except that a depth of 8 feet instead of 10 feet was obtained, the effort to secure the latter having been abandoned in 1900 on account of the difficult dredging.

The piers are 220 feet apart in their parallel portions. The west pier is 910 feet long and the east pier 572 feet long. The west pier extends out in the lake 300 feet farther than the east pier.

No work was done at this harbor between 1900 and 1907, there being no funds available.

An appropriation of $6,000 was made by the river and harbor act of March 2, 1907, for work at this harbor, and subproject for general repairs to piers, filling space between inner end of east pier and shore with stone, and removing about 7,500 cubic yards sand, etc., from channel was approved March 18, 1907.

This work was completed in 1908. No work was done during the fiscal year and none is proposed for the next fiscal year.

The amount expended to June 30, 1912, was $83,383.65, of which $70,607.96 was for construction and $12,775.69 for maintenance. The project is completed except maintenance.

June 30, 1912, the maximum draft that could be carried in the channel was 7 feet, and the usual variation is 3 feet.

The project has had no effect on freight rates.

The commerce of Pultneyville, which is a village of about 300 inhabitants, is insignificant; there were no arrivals or departures of vessels during the year 1911.

For more extended information and map, see page 2460 et seq., Annual Report of the Chief of Engineers for 1894.

Funds on hand will be expended when necessary for minor repairs to piers. No appropriation of funds for the fiscal year ending June 30, 1914, is recommended.

July 1, 1911, balance unexpended	$1,734.85
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	118.50
July 1, 1912, balance unexpended	1,616.35

(See Appendix P P 3.)

4. *Harbor at Great Sodus Bay, N. Y.*—This is a nearly land-locked bay, 27 miles west of Oswego Harbor, 2½ miles long and ½ to 1½ miles wide, with a depth of from 18 to 40 feet, connected with Lake Ontario by a channel 1,800 feet long between and beyond parallel piers. In its original condition this channel was wide and impracticable for vessels drawing over 8 feet.

The original project of 1829 was to narrow the entrance by constructing two converging breakwaters and to secure a channel of 12 feet depth by building two parallel piers about 450 feet apart, connecting with the ends of the breakwater, and by dredging. The present project, of 1882, is to obtain a depth of 15 feet at low water (zero of Oswego gauge) by extending the two piers a total of 1,100 feet and by dredging. After the piers had been extended to their present lengths, the project was modified July 18, 1896, to restore and maintain the channel 150 feet wide between the piers, flaring to 250 feet in the lake, to the requisite depth of 15 feet at low water, by dredging, without further extension of the piers for the present.

The amount expended on original project prior to operations under existing project was $475,646.80.

The existing project is to secure and maintain the channel 15 feet deep at low water for a width of 150 feet between piers flaring to 250 feet in Lake Ontario, without further extension of the piers for the present.

Maintenance will be required indefinitely. The piers are 438 to 473 feet apart; west pier 1,580 feet long, east pier 1,294 feet long, projecting beyond the shore line 1,150 and 1,294 feet, respectively. The west breakwater is 495 feet long and the east breakwater 1,438 feet long. Old timber superstructures have been replaced with concrete; west pier, 810 feet; east pier, 1,022 feet; breakwaters, none. The channel is unstable and required redredging annually.

During the fiscal year the work of replacing the old timber superstructure on piers with concrete was continued, and the channel between the piers was redredged. All work was done by hired labor and United States plant.

The limiting depth June 30, 1912, was 12 feet at low water in a channel width of 140 feet, and the usual variation of level of water surface is 3 feet.

The amount expended to June 30, 1912, was $577,644.85, of which $169,315.05 was for maintenance.

The project is reported to have a material effect in controlling freight rates on bulk commodities, such as coal, grain, lumber, and ore.

The following is a statement of commerce at this port for the past 10 years in short tons: 1902, 26,726; 1903, 18,875; 1904, 30,797; 1905, 46,251; 1906, 58,905; 1907, 78,057; 1908, 73,989; 1909, 34,577; 1910, 37,555; 1911, 55,693.

For more extended information and map, see Annual Report of the Chief of Engineers for 1894, page 2464 et seq.

A chart of Great Sodus Bay is issued in the series of charts of the survey of the northern and northwestern lakes, index 234.

Work proposed for the fiscal year ending June 30, 1914, is the continuation of replacing old-timber pier superstructures with concrete and redredging the channel to restore project depth. The appropriation recommended is for this work, in addition to funds on hand.

July 1, 1911, balance unexpended	$57,059.06
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	27,214.16
July 1, 1912, balance unexpended	29,844.90
July 1, 1912, amount covered by uncompleted contracts	2,860.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1]4,000.00

(See Appendix P P 4.)

5. *Harbor at Little Sodus Bay, N. Y.*—This is a nearly land-locked bay 13 miles west of Oswego Harbor, 2 miles long, one-fourth to five-eighths mile wide, with a depth of from 18 to 50 feet, connected with

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[1] Exclusive of the balance unexpended July 1, 1912.

Lake Ontario by a channel between 2,300 feet long and beyond parallel piers.

In its original condition this channel was about 150 feet wide and 18 inches deep.

The original project of 1854 was to protect the channel by building two parallel piers 250 feet apart across the bar to the 15-foot curve in the lake and to connect them with the shore by breakwaters. In 1867 this project was modified to provide for dredging to the depth of 12 feet. The present project, that of 1882, is to obtain a depth of 15 feet at low water (zero of Oswego gauge) by extending the piers to the 15-foot curve in the lake, and by dredging. The piers had been extended 835 feet to the following lengths: West pier, 1,747 feet; east pier, 1,510 feet, when the project was modified June 29, 1898, to restore and maintain the entrance channel, 150 feet wide, to the requisite depth of 15 feet by dredging, without further extension of the piers for the present; and this was modified by the river and harbor act of June 13, 1902, to extend the east pier 300 feet.

This extension was built—timber-crib superstructure and concrete superstructure—in 1904.

The amount expended on original project prior to operations under existing project was $338,441.77.

The existing project of 1882, with modifications to date, is to obtain and maintain an entrance channel between parallel piers connected to shores at inner end by breakwaters 150 feet wide and 15 feet deep at low water; to extend the east pier 300 feet; no further extension of the piers for the present.

The project is completed except maintenance, which will be required indefinitely.

The piers are 250 feet apart; west pier, 1,747 feet long; east pier, 1,810 feet long, projecting beyond the shore 1,550 and 1,810 feet, respectively. The west breakwater is 469 feet long, but entirely buried in sand and no longer maintained, and the east breakwater is 1,680 feet long.

Old timber superstructures have been replaced with concrete; west pier, 1,723 feet; east pier, 1,660 feet; breakwaters, none. The channel is unstable and requires redredging annually.

During the fiscal year the work of replacing the old timber superstructure on piers with concrete was continued and the channel between the piers was redredged. All the work was done by hired labor and United States plant.

The amount expended to June 30, 1912, was $492,859.10, of which $191,460.89 was for maintenance.

The minimum depth June 30, 1912, was 12¼ feet at low water, in a channel width of 140 feet, and the usual variation of level of water surface is 3 feet.

The project is reported to have a material effect in controlling freight rates on bulk commodities, such as coal, grain, lumber, and ore.

The following is a statement of commerce at this port for 10 years, in short tons: 1902, 52,543; 1903, 120,692; 1904, 137,258; 1905, 105,298; 1906, 103,991; 1907, 108,804; 1908, 153,474; 1909, 104,567; 1910, 112,607; 1911, 133,715.

For more extended information and map, see Annual Report of the Chief of Engineers for 1881, page 2443 et seq., and for 1894, page 2470 et seq.

A chart of Little Sodus Bay is issued in the series of charts of the Survey of the Northern and Northwestern Lakes, index 227.

Work proposed for the fiscal year ending June 30, 1914, is the continuation of replacing old timber superstructure with concrete and redredging the channel to restore project depth. Funds on hand are sufficient for this work and no appropriation is therefore recommended.

July 1, 1911, balance unexpended	$59,014.67
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	22,588.34
July 1, 1912, balance unexpended	36,426.33
July 1, 1912, outstanding liabilities	121.36
July 1, 1912, balance available	36,304.97

(See Appendix P P 5.)

6. *Harbor at Oswego, N. Y.*—This harbor, 59 miles east of Charlotte Harbor, comprises the lower part of Oswego River, a cove at its mouth, protected by a breakwater now known as the inner breakwater, and an outer harbor in Lake Ontario formed by an outer breakwater.

The outer harbor is 5,000 feet long and 600 feet wide, 9 to 16 feet deep; the inner harbor or cove, 1,000 feet long and 200 feet wide, 15 feet deep; the Oswego River for a distance of 2,200 feet from its mouth, 350 feet wide, 8 to 15 feet deep; the entrance channel around east end of outer breakwater, 1,000 feet long and 600 feet wide, 19 to 22 feet deep. In its original condition the harbor in the Oswego River was navigable by vessels of light draft only, and the cove at its mouth had no protection against the lake seas.

The original project of 1827 (completed in 1829) was to build across the cove a breakwater of timber cribs filled with stone. Between 1830 and 1838 a superstructure of masonry was built on 500 feet of this breakwater. Between 1866 and 1869, $41,000 was expended in dredging the harbor to the depth of 12 feet at extreme low water. Between 1868 and 1870 a lighthouse pier was built, extending north 437 feet from the channel end of the breakwater. In 1870 the project for an outer harbor formed by an outer breakwater was adopted, and in 1881 the outer breakwater was completed, having a lake face 4,870 feet long, a westerly shore return 916 feet long, and an easterly return of 246 feet long. In 1881 a modification was adopted to build an east breakwater, 248 feet of which was constructed in 1881 (removed in 1889) under further modification of project in 1883. Two spurs to the outer breakwater, 100 and 150 feet long, respectively, were built in 1885 and 1889.

In the acts of March 3, 1893, and August 18, 1894, special provisions were made for extending the deep-water area of the harbor in the mouth of the Oswego River by the removal of rock.

Further revision of project was adopted June 3, 1896, based on a special report printed in the Annual Report of the Chief of Engineers for 1895, page 3213 et seq., and subsequently modified in 1897 and 1899.

These modifications provided: First, to build an east breakwater 1,435 feet long, at an estimated cost of $197,000 (acts of Mar. 3, 1895, and June 3, 1896); second, to narrow the breach made in the outer breakwater in 1884 from 175 to about 75 feet, at an estimated cost of $18,500; third, to widen and deepen the inner harbor in the mouth of the Oswego River and to extend the deep-water area farther upstream by rock excavation.

The amount expended on the original project and the above noted modifications amounted in 1905 to $2,023,612.87.

The advisability of adopting a plan of permanent repair of the outer breakwater was the subject of a preliminary examination with estimate of cost, report printed in Annual Report of the Chief of Engineers for 1904, page 3368 et seq., and House Document No. 55, Fifty-eighth Congress, second session.

The river and harbor act of March 3, 1905, made an appropriation for continuing repairs under the method noted in the report as plan "(*b*)".

The river and harbor act of March 2, 1907, authorized and began making appropriations for the permanent repair of the outer breakwater under plan "(*a*)" in the above-mentioned House Document, at an estimated cost of $900,000.

The existing project is therefore fundamentally the project of 1870, including the original project and the numerous modifications to date.

The uncompleted items are: (1) To build an east breakwater 1,435 feet long; (2) to narrow the breach in the outer breakwater from 175 to about 75 feet; (3) to widen and deepen the inner harbor in the mouth of the Oswego River and to extend the deep-water area farther upstream by rock excavation; (4) to permanently repair the outer breakwater under plan (*a*); (5) Maintenance of the inner breakwater and lighthouse pier, 1,430 and 564 feet long, respectively; (6) maintenance of the entrance channel and outer harbor basin to depth of 15.7 feet and inner harbor to 15 feet at low water (zero Oswego gauge). Items (1) and (3) are not considered necessary or advisable under existing conditions of commerce; items (2) and (4) are in progress; items (5) and (6) will be required indefinitely.

During the fiscal year, the breakwater repair work was continued by the method authorized under plan (*a*) viz, to place a heavy stone riprap along the lake face and to replace the old timber superstructure with concrete. The placing of stone riprap was about 75 per cent completed; a new crib 44 feet long was built ready to be placed, which will narrow the breach in the breakwater to 119 feet; proposals were invited for reconstructing with concrete 800 linear feet of old breakwater superstructure, and a favorable bid was received at opening on July 1, 1912; the outer harbor was redredged, with U. S. dredge *Sodus;* a new dredge, the *Sodus*, and two dump scows were built, hull, etc., by day's labor and machinery by contract, and other United States plant extensively repaired.

The amount expended for all work to June 30, 1912, was $2,467,199.04. It is impracticable to separate the cost of construction and maintenance.

June 30, 1912, the minimum depth at low water over the shoalest part of the locality under improvement was 14 feet.

The usual variation of level of water surface is 3 feet.

The project is reported to have a material effect in controlling freight rates on bulk commodities, such as coal, grain, lumber and ore.

The following is a statement of the commerce of this harbor for the past 10 years, in short tons: 1902, 234,009; 1903, 733,734; 1904, 712,481; 1905, 724,502; 1906, 615,840; 1907, 728,090; 1908, 724,187; 1909, 669,387; 1910, 751,363; 1911, 869,965.

Report of survey of the outer breakwater is printed without map on page 3363 et seq., of the Annual Report of the Chief of Engineers for 1904, with map, in House Document No. 55, Fifty-eighth Congress, second session.

For more extended information and map, see Annual Report of the Chief of Engineers for 1881, page 2451, et seq., and for 1895, page 3204 et seq.

A chart of Oswego Harbor is published in the series of charts of the Survey of the Northern and Northwestern Lakes, index 225; and an index map, facing page 2536 of the Annual Report of the Chief of Engineers for 1911.

The funds recommended to be appropriated for the fiscal year ending June 30, 1914, will be used to continue the permanent repair of the outer breakwater under plan (*a*) and for maintenance.

July 1, 1911, balance unexpended	$193,651.24
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	83,760.64
July 1, 1912, balance unexpended	109,890.60
July 1, 1912, outstanding liabilities	359.20
July 1, 1912, balance available	109,531.40
Amount appropriated by river and harbor act approved July 25, 1912	85,000.00
Amount available for fiscal year ending June 30, 1913	194,531.40
July 1, 1912, amount covered by uncompleted contracts	22,885.48
Amount (estimated) required to be appropriated for completion of existing project	[1] 415,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 110,000.00

(See Appendix P P 6.)

7. *Harbor at Cape Vincent, N. Y.*—This harbor in its original condition was an open roadstead on the St. Lawrence River, 2½ miles from Lake Ontario, and is a convenient location for vessels to lie during storms, at night, and in thick weather. It consists of a river wharf frontage 1½ miles long and 500 feet wide, 12 feet deep at wharves, increasing to 23 feet deep at breakwater.

The original project of 1896 was to build a breakwater, 1,600 feet long, parallel to and 600 feet from the railroad wharf, at an estimated cost of $320,000. On May 13, 1899, this project was modified to build a breakwater parallel to and 500 feet from the railroad wharf 1,550 feet long, of which length 150 feet, or so much thereof as required, was to be shore return at upper end, at an estimated cost of $200,000. This is the existing project, which is, including work in progress, three-fourths completed. Nine hundred and ten feet of this breakwater, of which 50 feet is shore return, has been built and construction, under contract, of 220 feet is in progress. Farther extension of the shore return is not considered necessary. This improvement is intended to make a harbor of refuge for all craft plying between Lake Ontario and the St. Lawrence River.

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[1] Exclusive of amount available for fiscal year 1913.

During the fiscal year a contract was made to extend the breakwater 220 feet, and the work is fairly underway, to be completed during the next fiscal year. A watchman was employed through the year to regulate mooring of vessels to the breakwater.

The amount expended to June 30, 1912, was $132,148.55, of which $389.80 was for maintenance.

The maximum draft that could be carried over the locality under improvement at low water June 30, 1912, was 19 feet, and the usual variation of level of water surface is 3 feet.

The following is a statement of the commerce of this port, in short tons, for 10 years: 1902, 4,175; 1903, 15,666; 1904, 20,083; 1905, 21,750; 1906, 112,501; 1907, 21,946; 1908, 33,573; 1909, 42,077; 1910, 33,344; 1911, 13,178.

The project has provided facilities that make navigation more safe and thus affects freight rates.

For more extended information and map, see Annual Reports of the Chief of Engineers for 1897, page 3286 et seq., and for 1903, page 2162 et seq.

Work proposed for the fiscal year ending June 30, 1914, is the further extension of the breakwater, and the appropriation recommended is the balance of the original but inadquate estimate to complete the project.

July 1, 1911, balance unexpended	$34, 136. 36
June 30, 1912, amount expended during fiscal year, for works of improvement	2, 284. 91
July 1, 1912, balance unexpended	31, 851. 45
July 1, 1912, amount covered by uncompleted contracts	27, 481. 83
Amount (estimated) required to be appropriated for completion of existing project	[1] 36, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 36, 000. 00

(See Appendix P P 7.)

8. *Harbor at Ogdensburg, N. Y.*—On St. Lawrence River 62 miles from Lake Ontario. It consists of dredged channels 100 to 600 feet wide, present depth 14 to 21 feet, to and along a river wharf frontage of 2 miles. In its original condition the low-water depth of this harbor was 9 feet in the upper entrance channel leading to the Oswegatchie River, 10 to 12 feet in the two lower entrance channels, and 6 to 12 feet along the city front.

The original project of 1868 was to dredge the channels to and along wharves to the depth of 12 feet and to build, if necessary, 5,500 linear feet piers, at an estimated cost of $100,000. The piers were never built. The project of 1882 provided for dredging the upper entrance channel from the St. Lawrence River channel across the shoal to and into the mouth of the Oswegatchie to 16 feet, and the lower entrance channels and channels along the city front to 15 feet at extreme low water, at an estimated cost of $75,000.

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[1] Exclusive of the balance unexpended July 1, 1912.

The project of 1890 provided for dredging all the channels to a depth of 16.5 feet below the zero of the Ogdensburg gauge (15 feet below the zero of the Oswego gauge), at an estimated cost of $158,950. This project was modified February 27, 1897, to deepen the two lower entrance channels to 16 feet below the zero of Oswego gauge, and by act of March 3, 1899, further modified to dredge 900 feet of the channel along the city front, above Franklin Street, to but 14 feet below the same zero, the projected depths of the upper entrance channel to and into the mouth of the Oswegatchie River up to the bridge and the balance of the channel along the city front to remain 15 feet. This project was completed in July, 1903.

The amount expended on original project, prior to operations under existing project, was $401,875.97.

The present project, adopted by the river and harbor act of June 25, 1910, is to deepen the several channels of the harbor to 19 feet below the zero of the Ogdensburg gauge (low water, 243.23 feet above mean tide at New York City), and to remove wholly the middle ground between the two lower entrance channels to the same depth, at an estimated cost of $187,970, in accordance with report printed in House Document No. 920, Sixtieth Congress, first session.

During the fiscal year dredging of all channels under contract was under way and will be completed in 1913.

The amount expended to June 30, 1912, was $440,533.73, of which $130,512.32 was for maintenance, and $38,657.76 on existing project.

The maximum draft that could be carried over the improvement at low water (zero of new Ogdenburg gauge corresponding to zero of Oswego gauge) June 30, 1912, was as follows: In the lower entrance channels and channel between them, 19 feet; city front channels, below Caroline Street, 19 to 15 feet, above Caroline Street, 14 feet; upper entrance channel and in mouth of Oswegatchie, 15 feet. The usual variation of level of water surface is 3 feet.

The project probably has a material effect in controlling freight rates on bulk commodities, such as coal, grain, lumber, and ore.

The following is a statement of commerce at this port for the past 10 years, in short tons: 1902, 837,025; 1903, 1,185,785; 1904, 898,257; 1905, 1,034,085; 1906, 1,056,100; 1907, 1,238,498; 1908, 856,714; 1909, 1,049,985; 1910, 1,004,317; 1911, 799,587.

For more extended information and map, see Annual Report of the Chief of Engineers for 1898, page 2812 et seq., and for 1911, page 2540. Reference to reports on examination and survey made in compliance with act of March 2, 1907, will be found on page 779 of report for 1908, printed in House Document No. 920, Sixtieth Congress, first session.

Work proposed for the fiscal year ending June 30, 1914, is the removal of the middle ground between the lower entrance channels, and it is recommended that $37,970 be appropriated for work during that year. Balance of funds on hand will be required for maintenance.

July 1, 1911, balance unexpended	$113,823.14
June 30, 1912, amount expended during fiscal year, for works of improvement	37,418.58
July 1, 1912, balance unexpended	76,404.56
Amount appropriated by river and harbor act approved July 25, 1912	20,000.00
Amount available for fiscal year ending June 30, 1913	96,404.56
July 1, 1912, amount covered by uncompleted contracts	58,452.58
Amount (estimated) required to be appropriated for completion of existing project	[1] 67,970.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 37,970.00

(See Appendix P P 8.)

EXAMINATION AND SURVEY REQUIRED BY THE RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports dated March 28, 1911 and January 16, 1912, with map, on preliminary examination and survey, respectively, of *Olcott Harbor, N. Y., with a view to securing increased depth*, required by the river and harbor act approved June 25, 1910, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 780, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $3,000 for first construction, and the maintenance of the west pier for a period of five years at an estimated cost of $2,500, subject to certain local cooperation, is presented.

The local officer was also charged with the duty of making a preliminary examination and survey, provided for by the river and harbor act approved June 25, 1910, of *Great Sodus Bay*, *N. Y.*, and reports thereon will be duly submitted when received.

IMPROVEMENT OF RIVERS AND HARBORS IN THE LOS ANGELES, CAL., DISTRICT.

This district was in the charge of Capt. Chas. T. Leeds, Corps of Engineers, until December 8, 1911; in the temporary charge of Capt. W. P. Stokey, Corps of Engineers, from December 8, 1911, to January 6, 1912; and in the charge of Lieut. Col. C. H. McKinstry, Corps of Engineers, from January 6, 1912, to date. Division Engineer, Col. John Biddle, Corps of Engineers, until July 20, 1911; and Lieut. Col. Thos. H. Rees, Corps of Engineers, from July 20, 1911, to date.

1. San Diego Harbor, *Cal.*—San Diego Harbor is just north of the United States-Mexico boundary, 89 nautical miles southerly of Los Angeles Harbor, and 482 nautical miles southerly of San Francisco. At 21-foot depth of water at mean lower low water it has a width varying from 500 feet to 2,000 feet, and is about 9 miles long. The total water area is about 21 square miles at half tide.

At the time of the adoption of the original project the governing depth on the bar at mean lower low water was 21 feet, with a width of channel of 500 feet. Just inside the entrance was a middle ground, with a channel through it carrying about the same depth as the channel through the outer bar. The main channel, lying to the west of the middle ground, was of ample depth, but was difficult of navigation on account of two sharp turns.

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[1] Exclusive of amount available for fiscal year 1913.

The river and harbor act approved March 3, 1875, appropriated $80,000 for the construction of a dike across the mouth of San Diego River to make it empty into False Bay and thus prevent injury to San Diego Harbor from deposit of material brought down during floods. This work was completed in 1876 at a cost of $79,798.72. The cost of repairs made since has brought the total of expenditures to $86,832.03. Further repairs to the dike have been made by the city of San Diego.

The project for the improvement of the harbor, adopted by the river and harbor act approved September 19, 1890, provided for the construction of a jetty on Zuninga Shoal at the entrance to the harbor; the maintenance of a channel 24 feet deep at mean low tide and 500 feet wide through the middle ground, and repairs to the restraining dike. The jetty was to rise to the height of extreme high water and to be about 7,500 feet long, with a view to producing a depth of 26 feet at mean lower low water on the outer bar.

The original estimated cost of this improvement was $394,400. This estimate was increased in June, 1900, to $542,850. With this amount the jetty was extended to its full contemplated length of 7,500 feet, a channel 26 feet deep and 271 feet wide (28 feet deep over a width of 171 feet) was dredged across the outer bar, and a channel 26 feet deep and 400 feet wide was dredged across the middle ground. Later the channels through the outer bar and the middle ground both shoaled to 24 feet deep. The amount expended on this harbor up to the completion of this project was $625,211.68.

The river and harbor acts of March 3, 1905, March 2, 1907, and March 3, 1909, appropriated in all $60,000 for maintenance. Under contracts, 15,625 cubic yards, at 60 cents per yard, 37,750 cubic yards, at 51 cents per yard, and 100,904 cubic yards, at $0.2874 per yard, were dredged and dumped at sea in 1906, 1907, and 1909, respectively. A channel from 27 to 30 feet deep was maintained. The amount expended on this project (maintenance) was $59,904.21.

The existing project is contained (with map) in House Document No. 961, Sixtieth Congress, first session, and was adopted by Congress in the river and harbor act of June 25, 1910. One hundred and twenty-five thousand dollars was appropriated by that act for carrying out the project, which contemplated dredging a channel through the outer bar 30 feet deep and 600 feet wide, with side slopes of 1 on 5, and also a channel through the middle ground to a depth of 30 feet; this latter channel to be 400 feet wide at its southerly end and to widen out at the northerly end in order better to accommodate vessels using the United States Navy coaling station at La Playa. No modification has since been made in this project. On October 24, 1910, a contract was entered into for doing this dredging at $0.1489 per cubic yard, work to begin May 1, 1911. Work began May 31, 1911. During the fiscal year ending June 30, 1912, 370,093 cubic yards was removed from the bar channel, and

330,455 yards from the middle-ground channel. Amount expended during the fiscal year under the project (new work) was $123,742.29.

The dredging contact was completed May 3, 1912, a total of 411,027 cubic yards having been removed from the outer bar channel, and 378,114 yards from the middle-ground channel, or 789,141 yards in all. This material was dumped at sea. A channel 600 feet wide and 30 feet deep (32 feet deep over a width of 300 feet) was dredged through the outer bar, and a channel 30 feet deep and of a width increasing from 700 feet at the south end to 1,000 feet at the north end was dredged through the middle ground. This completed the project.

Up to the close of the fiscal year (June 30, 1912) a total of $124,703.68 was expended on the project, all for new work.

The maximum draft that could be carried into the harbor at mean lower low water on June 30, 1912, was 30 feet. The average height of all high waters above the plane of reference is 4.8 feet. The average of the higher high tides is 5.5 feet.

On February 5, 1912, the harbor lines approved June 21, 1892, were modified by the Secretary of War.

The commerce of this harbor was 395,634 short tons for the calendar year 1911. It consisted principally of lumber, crude oil, coal, manufactured iron and steel, and general merchandise. Its value is estimated at $41,164,243.

The largest vessels using this harbor are the 8,000 to 12,000 ton vessels of the American-Hawaiian Line, which maintains a weekly service to Salina Cruz, San Diego, San Francisco, etc. The completion of work under the last project will permit these vessels to enter at any stage of the tide, while heretofore, from time to time, they had to wait for a stage above the low. No new lines of water transportation have been established during the year. A railroad (the San Diego and Arizona) is under construction between San Diego and Yuma. It will make San Diego a distributing and concentrating point for the Imperial Valley. The freight rate from Atlantic coast points to San Diego, via Tehauntepec or Panama, is from 20 to 30 per cent less than the all-rail rate. The city of San Diego is just entering upon the construction, at a cost of about $1,000,000, of a harbor terminal, the use of which will reduce the cost of loading and unloading vessels at this port. Making due allowance for the difference in the wages paid native and foreign crews, delay in passing through the canal, etc., the completion of the Panama Canal should effect a considerable reduction in rail and water rates to and from San Diego.

There has not been time since the completion of the last United States project for any effect to be produced upon the volume of commerce at this point. The full effect of this work and of the municipal improvements just beginning will not manifest itself until after the opening of the Panama Canal.

The additional funds asked for to be expended during the fiscal year ending June 30, 1914, are for maintenance, and will be applied towards maintaining the project depth, 30 feet, in the channels through the outer bar and middle ground.

July 1, 1911, balance unexpended	$124,272.72
June 30, 1912, amount expended during fiscal year, for works of improvement	123,742.29
July 1, 1912, balance unexpended	530.43
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 35,000.00

(See Appendix Q Q 1.)

2. Los Angeles Harbor, Cal.—Los Angeles Harbor is 393 nautical miles southerly of San Francisco and 89 nautical miles northerly of San Diego Harbor. It consists of two parts: (*a*) The outer or breakwater harbor, formerly designated San Pedro Harbor, and (*b*) the inner harbor, formerly designated Wilmington Harbor. On account of the consolidation of the cities of San Pedro and Wilmington with Los Angeles on August 12, 1909, later appropriations for these works were made under the name of Los Angeles Harbor.

(*a*) *The outer harbor.*—Originally San Pedro Bay was an open roadstead, with a considerable amount of kelp, well protected on the west by the bluff which terminates at Point Fermin, but exposed to the southeast, south, and southwest.

The river and harbor act of June 3, 1896, authorized the appointment of a board to select the location of a breakwater at Santa Monica Bay or San Pedro Bay, Cal., and to make plans, specifications, and estimates therefor. The Secretary of War was authorized to make contracts for the completion of the work in accordance with the project of the board at a cost not exceeding $2,900,000. The board submitted its report March 1, 1897, in favor of San Pedro Bay. This report is printed (with maps and drawings) in Senate Document No. 18, Fifty-fifth Congress, first session.

The project of the board contemplated a breakwater to the eastward of Point Fermin about 8,500 feet in length, or as much longer as could be constructed within the authorized limit of cost, $2,900,000. The project was adopted by Congress in the river and harbor act of June 3, 1896.

On August 12, 1898, a continuing contract was entered into for the construction of the breakwater for $1,303,198.54. This contract was annulled on March 19, 1900, on account of unsatisfactory progress. Under this contract 86,610 tons of stone was placed in the foundation course at a cost, including inspection, of $51,537.43.

On June 7, 1900, a continuing contract for completing the breakwater was entered into. The estimated cost of work under this contract for a breakwater 8,500 feet long was $2,375,546.05. An extension of the breakwater to 9,250 feet in length was later estimated to cost about $272,500 additional. Work under this contract began August 29, 1900, at the westerly end of the breakwater and the breakwater 9,250 feet long was completed September 9, 1910. Under this contract 2,230,928 long tons of stone, at $0.844 per ton, was deposited in the substructure; 232,641 long tons of stone, at $3.10 per ton, was placed in the superstructure; 13,598 long tons of additional stone, at $2 per ton, was placed at the toe of the slope of the ocean wall of the superstructure to prevent undermining thereof; and a concrete block 40 feet square and 20 feet high, beginning 3 feet below low water, was built at the outer end of the breakwater at a cost of $6 per cubic yard. The adopted project contemplated a concrete block at each end of the breakwater, but in view of the project to extend the breakwater to the shore, the concrete block proposed for the shore end of the breakwater was decided to be unnecessary. A supplemental contract for the extension of the rectangular stone blocks of the superstructure to the westerly end of the breakwater, in lieu of the concrete block, was entered into November 24, 1909, and approved by the Secretary of War on June 11, 1910.

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[1] Exclusive of the balance unexpended July 1, 1912.

The amount expended under the project is $2,830,400.85, including $35,555.76 expended by the board.

The breakwater as built is of somewhat stronger cross section than as planned by the board. It consists of two straight arms connected by a curve 1,800 feet in length, of 1,910 feet radius. The westerly arm is 3,000 feet long, pointing S. 72° E. (magnetic); the easterly arm, as extended, 4,450 feet long, pointing N. 54° E. (magnetic). A gap of about 1,850 feet was left between the east shore of Point Fermin and the westerly end of the breakwater. The construction of the breakwater has resulted in the dying out of the kelp, and there is now afforded a harbor of refuge, easy of access and secure from storms, for vessels of the largest size. It shelters 370 acres with 30 to 50 feet depth at mean lower low water, and 200 acres additional (outside established harbor lines) with 20 to 30 feet depth at mean lower low water. Two channels 30 feet deep have been dredged by private enterprise, each about 5,500 feet long, alongside wharves constructed or under construction. The breakwater also shelters the entrance to the inner harbor.

Of the $2,900,000 appropriated as the authorized cost of the project there remains an available balance of $69,599.15. Pursuant to authority in department indorsement of August 12, 1910, about $55,000 of this amount, together with the $178,000 appropriated by Congress June 25, 1910, was made available for extending the breakwater to the shore.

The existing *breakwater* project (for *dredging* project, see next paragraph) is to extend the breakwater to the shore and is printed (without map) in House Document No. 969, Sixtieth Congress, first session, and was authorized by Congress in river and harbor act of June 25, 1910, which appropriated $178,000 for the work. No modification has been made in this project. The breakwater extension is to be built of random rubble stone to a height of 15 feet above mean lower low water, with a top width of 15 feet and slopes of 1 vertical to 1½ horizontal on the ocean side and 1 vertical to 1⅓ horizontal on the harbor side. Its length is 1,887 feet, and it is estimated to contain 142,400 long tons of stone. The amount expended on this project up to June 30, 1912, is $166,745.92. A contract for doing this work at $1.38 per long ton of stone was entered into January 4, 1911. During the fiscal year ending June 30, 1912, 114,207 long tons of stone was placed, making a total under the contract of 129,362 tons. The work is completed to full height for about 1,667 linear feet and is to low water for about 220 feet additional. The project is about 91 per cent completed. The result of the work done is to quiet the water of the anchorage area and alongside the wharves of the outer harbor.

The river and harbor act of June 25, 1912, adopted a project for dredging to the depth of 35 feet an area in the outer harbor, lying between the 35-foot contour in the bay and the pierhead line at the outer end of the property of the Outer Harbor Dock & Wharf Co., and at the outer end of that part of the city's property which lies just west of the inner harbor entrance, and appropriated $327,250 for carrying out this project. This project is printed (without map) in River and Harbor Committee Document No. 8, Sixty-second Congress, second session.

The Outer Harbor Dock & Wharf Co. is reclaiming about 156 acres in the outer harbor and constructing wharves, warehouses, etc. It has constructed around this area 11,850 linear feet of bulkhead, has deposited behind these bulkheads 1,984,630 cubic yards of material dredged from the east and west channels, and has constructed 5,295 feet of wharf frontage. The east channel has been dredged to a depth of 30 feet at mean lower low water and 266 feet wide for its full length out to the 30-foot contour. The west channel has been dredged to 30-foot depth and 400 feet wide out to the 22-foot contour. The northerly 1,200 feet of this channel has been widened to 600 feet.

The Pacific Wharf & Storage Co. has inclosed within a stone bulkhead east of the east jetty and north of Deadmans Island an area of about 80 acres, a portion of which has been reclaimed. They have also dredged a slip 30 feet deep, 250 feet wide, and 1,735 feet long in this area, and have constructed a wharf 1,402 feet long along the westerly side of the slip. The San Pedro, Los Angeles & Salt Lake Railroad Co. has also bulkheaded and reclaimed with material deposited by the Government dredge about 81 acres of land north of the area under improvement by the Pacific Wharf & Storage Co.

The city of Los Angeles has begun the improvement of 79 acres on the westerly side of the entrance channel.

(*b*) *The inner harbor.*—Previous to the commencement of improvement, in 1871, there was a depth of less than 2 feet of water at low tide at the present entrance, the sea breaking across what is now Terminal Island at various points. Vessels anchored in the outer harbor, and cargoes and passengers were transferred by lighters to Wilmington. Wilmington Lagoon was a large expanse of shallow water, containing but one good channel, namely, the channel leading to Wilmington.

Outside pierhead lines the inner harbor now contains 770 acres, of which 113 acres have been dredged by the United States to 30 feet and 46 acres to 25 feet. In addition a channel 9,000 feet long, 20 feet deep, and 200 feet wide has been dredged by the United States in the east basin; the city of Los Angeles has done certain dredging in Mormon Island Channel and Wilmington Basin, and a channel about 3,300 feet long has been dredged by private enterprise from the east basin to the property of the Consolidated Lumber Co.

The original project, approved July 1, 1871, contemplated gaining a depth of 10 feet at mean low tide by the construction of training walls to confine the tidal scour.

This depth was obtained in 1881, at a cost of $555,000, when a further project to increase the depth of channel to 15 feet at mean low tide by dredging a reef between the jetties, raising existing works, and extending the jetties to 18 feet of water was submitted. This project was completed in 1893, at a cost of $399,497.68.

The river and harbor act of June 3, 1896, appropriated $50,000 for improving the harbor in accordance with a project submitted in 1894 for a channel depth of 18 feet at mean low tide, at an estimated cost of $392,725. Owing to certain provisos, however, this money was not available without further action by Congress.

The project for the partial improvement of the inner harbor, adopted by the river and harbor act of June 13, 1902, provided for a channel 20 feet deep and 400 feet wide from the outer harbor to the foot of the wharves, and 24 feet deep between harbor lines from the foot of the wharves to and including a turning basin 1,600 feet in diameter just below Mormon Island. It also provided for repairs to the east jetty and for the construction of a dike to divert the waters of the Los Angeles River from Wilmington Lagoon. The same act made available the $50,000 appropriated by the act of June 3, 1896.

Changed conditions have rendered the building of the dike inadvisable.

The original estimated cost of the work called for by the partial project, including the procurement of a dredging plant, was $550,000. This estimate was later increased to $663,000, which amount has been appropriated.

Repairs were made to the east jetty at a cost of $3,700.

The 20-inch suction dredge *San Pedro*, with the necessary discharge pipe, floating plant, etc., was built at a total cost of $118,721.78. It began dredging the harbor April 1, 1905, and up to June 30, 1910, it had dredged 4,322,361 cubic yards of material and deposited it behind bulkhead lines on Terminal and Smiths Islands, or outside the jetties, at a cost, including deterioration of plant, supervision, and office expenses, of $364,261.45, or about $0.084 per cubic yard. Under contract 605,125 cubic yards was dredged at a cost of $208,474.30 (contract payments only).

A channel was dredged to a width of 400 feet and a mean lower low-water depth of 21 feet, except for a short distance abreast of Deadmans Island, where the depth was only 20 feet from the outer harbor up to the lower end of the wharves. From this latter point up to and including the turning basin, 1,600 feet in diameter, just above Smiths Island, a total distance of about 14,000 feet, the channel was dredged to a depth of 25.5 feet and to the full width between wharves.

This project was completed June 25, 1910, at a cost of $674,948.09.

The existing projects (without maps) for the improvement of the inner harbor are printed in House Document No. 1114, Sixtieth Congress, second session, and House Document No. 768, Sixty-first Congress, second session, and were adopted by the river and harbor act approved June 25, 1910. They provide for—

First, dredging to 30-foot depth at mean lower low water from the entrance up to and including the turning basin. It was estimated that this work would require the dredging of 3,000,000 cubic yards of material at a cost of 14 cents per yard, or $420,000. On June 30, 1911, the increase of this estimated cost to $596,000 was authorized for the following reasons: The original estimate for this work contemplated doing all the dredging by suction with the U. S. dredge *San Pedro*. The character of the material in the outer 5,600 feet of the channel, and especially opposite Deadmans Island, was such that it was found necessary to handle the same by clamshell or dipper dredge.

A total of $495,000 has been appropriated for this work by the river and harbor acts of June 25, 1910, February 27, 1911, and July 25, 1912.

Second, dredging two channels from the turning basin into the east and west basins, respectively, the channels to be 200 feet wide and 20 feet deep. It was estimated that this work would require the removal of 2,200,000 cubic yards of material at an estimated cost of $390,000, including the construction of a dredge, subsequently reduced to $220,000.

No modifications have been made in these projects.

The amount expended on these projects to June 30, 1912, is $497,657.18. Receipts from the sale of condemned property during the year amounted to $41.50.

Under the first, or 30-foot project, a contract was entered into December 8, 1910, for dredging 333,333 cubic yards of material in the entrance channel at 42 cents per yard. Work under this contract began January 19, 1911, and was completed January 29, 1912, a total of 333,333 yards having been excavated at a cost (including engineering and office expenses) of $143,138.62. During the fiscal year ending June 30, 1912, 170,597 yards were excavated at a total cost of $73,280.52.

On July 22, 1911, a contract was entered into for dredging the easterly 200 feet of the entrance channel at 41.5 cents per yard. Work under this contract began October 12, 1911, and up to the close of the fiscal year 315,339 yards had been dredged and dumped at sea at a total cost of $134,038.04, practically completing the contract. Under these two contracts a channel 400 feet wide, 30 feet deep at mean lower low water, was dredged from the outer harbor up to the northerly end of Deadmans Island, a distance of 5,600 feet.

During the fiscal year ending June 30, 1912, the U. S. dredge *San Pedro* was engaged in dredging for full width between wharves from Station 102+80 to Station 144. A total of 692,087 cubic yards, consisting of silt, quicksand, shell, yellow and blue clay, layers of sandstone and cobbles, was dredged, pumped an average distance of 1,765 feet, and deposited onto lands of the Pacific Wharf & Storage Co. and of the Salt Lake Railroad Co. and into San Pedro Bay outside of the Salt Lake Railroad Co.'s seawall. This dredging was done at a cost of $78,112.56, or 11.29 cents per yard, including engineering and office expenses and extraordinary repairs to the dredge. These repairs consisted of dry docking dredge and resheathing the hull, and installing a new dredging pump, cutters, etc. These and other repairs made at the time the dredge was laid up for its semiannual overhauling and repairs were made at a cost of $17,409.94.

No deduction is made for deterioration of plant, as the repairs made to dredge during the year were such as to render the dredge of equal or greater value than at the beginning of the year.

It is estimated that 64 per cent of the 30-foot project has been completed.

Under the second, or 20-foot project, a contract was entered into October 15, 1910, for dredging channels 200 feet wide and 20 feet deep from the turning basin into the east and west basins, respectively. It is estimated that this work will require the removal of 2,200,000 cubic yards of material, which at the contract price of $0.089725 per yard will cost $197,395, supervision and inspection not included. Work under this contract began January 10, 1911, and up to the end of the fiscal year 1,108,579 cubic yards of material had been dredged in the east basin, completing the channel. Of this amount, 67,000 yards was deposited in the channel by the floods of March, 1911, and was not included in the project estimate. The Comptroller of the Treasury has decided that this 67,000 yards can not be paid for under the contract.

The cost of dredging the 1,041,579 (1,108,579—67,000) yards, including inspection and office expenses, was $98,628.47. About 47 per cent of the 20-foot project has been completed.

From the outer harbor to within a short distance of the turning basin the ruling depth is 30 feet; thence through the turning basin, 22½ feet; thence throughout the channel in the east basin and to the Consolidated Lumber Co.'s. plant, 20 feet; in the Mormon Island Channel, 25 and 30 feet; and in the Wilmington Basin, 25 feet, with an approach channel 20 feet deep. The average rise of tides above the plane of reference is 5.1 feet.

The fixed railroad trestles across the entrance to the west basin are being replaced by a bascule bridge of 180 feet clear span, under order of the Secretary of War dated December 7, 1910. The time of completion has been extended to September 27, 1912.

The result of the work done by the United States is to make 16,000 linear feet of wharf frontage accessible to vessels drawing down to 30 feet, and to increase the draft that can be carried to the upper parts of the inner harbor.

For the calendar year 1911 the commerce of this port amounted to 1,720,711 short tons. It consisted principally of lumber, crude oil, and general merchandise received, and of general merchandise and crude oil shipped. Its value is estimated at $77,704,843.

It is difficult to estimate the effect of these improvements on freight rates, since into that matter so many factors enter besides depth of water. Lumber is the largest item of commerce at this port. The rate on lumber from Puget Sound and Oregon-Washington ports to this harbor is about the same to-day as it was 10 years ago. The most perceptible effect of the improvement is in the volume of commerce, which has increased 300 per cent in the last 10 years.

There are three regular lines of coasting freighters that touch at this harbor and make the ports of Panama and Salina Cruz. Since the reduction in the rail rate San Pedro-Los Angeles below the rate San Diego-Los Angeles, the American-Hawaiian Line has arranged to touch at San Pedro. Vessels of the Harrison and Kosmos Lines land regularly at the wharf of the Outer Harbor Dock & Wharf Co., and recently 9,000 tons of grain, raised in the Imperial Valley (on the Mexico side), has been shipped in bond to Liverpool from this same wharf.

The full effect of the work done by the United States in the improvement of this harbor will not be realized until after the opening of the Panama Canal. The all-rail rate from the Atlantic coast to Los Angeles is from 20 to 30 per cent higher than the "water" rate, the latter being the rate via Tehuantepec or Panama. The volume of commerce via Tehuantepec and Panama, moreover, is restricted by the limited capacity of the transisthmian railroads. The all-rail rate on citrus fruits Los Angeles to Atlantic coast points is $23 a ton. It is estimated that after the opening of the canal citrus fruits can be profitably taken from Los Angeles to New York, Philadelphia, or Boston for $11 a ton. The rate for about the same distance from Mediterranean ports to New York is $7 a ton. The citrus crop raised within 100 miles of San Pedro amounts to about 75,000 carloads (14 tons per car).

The funds asked for herein for the fiscal year ending June 30, 1914, will be used in completing the 30-foot and 20-foot projects.

BREAKWATER.

July 1, 1911, balance unexpended	$68, 807. 80
June 30, 1912, amount expended during fiscal year, for works of improvement	8. 40
July 1, 1912, balance unexpended	68, 799. 40
July 1, 1912, amount covered by uncompleted contracts	[1] 55, 000. 00

BREAKWATER EXTENSION.

July 1, 1911, balance unexpended	$168, 771. 13
June 30, 1912, amount expended during fiscal year, for works of improvement	156, 717. 25
July 1, 1912, balance unexpended	12, 053. 88
July 1, 1912, outstanding liabilities	8, 047. 26
July 1, 1912, balance available	4, 006. 62
July 1, 1912, amount covered by uncompleted contracts	4, 006. 62

DREDGING IN OUTER HARBOR.

Amount appropriated by river and harbor act approved July 25, 1912	$327, 250. 00
Amount available for fiscal year ending June 30, 1913	327, 250. 00

DREDGING IN INNER HARBOR TO 30 FEET.

July 1, 1911, balance unexpended	$357, 018. 69
Receipts from sale of condemned property	41. 50
	357, 060. 19
June 30, 1912, amount expended during fiscal year, for works of improvement	286, 799. 83
July 1, 1912, balance unexpended	70, 260. 36
July 1, 1912, outstanding liabilities	6, 548. 72
July 1, 1912, balance available	63, 711. 64
Amount appropriated by river and harbor act approved July 25, 1912	25, 000. 00
Amount available for fiscal year ending June 30, 1913	88, 711. 64
July 1, 1912, amount covered by uncompleted contracts	31, 249. 54
Amount (estimated) required to be appropriated for completion of existing project	[2] 101, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[2] 101, 000. 00

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[1] To be expended in completion of breakwater extension.

[2] Exclusive of amount available for fiscal year 1913.

DREDGING TWO CHANNELS FROM TURNING BASIN TO EAST AND WEST BASINS OF INNER HARBOR.

July 1, 1911, balance unexpended	$157,592.12
June 30, 1912, amount expended during fiscal year, for works of improvement	46,781.43
July 1, 1912, balance unexpended	110,810.69
July 1, 1912, outstanding liabilities	93.59
July 1, 1912, balance available	110,717.10
July 1, 1912, amount covered by uncompleted contracts	99,889.89
Amount (estimated) required to be appropriated for completion of existing project	[1] 20,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 20,000.00

CONSOLIDATED.

July 1, 1911, balance unexpended	[2] $752,189.74
Receipts from sale of condemned property	41.50
	752,231.24
June 30, 1912, amount expended during fiscal year, for works of improvement	[2] 490,306.91
July 1, 1912, balance unexpended	261,924.33
July 1, 1912, outstanding liabilities	14,689.57
July 1, 1912, balance available	247,234.76
Amount appropriated by river and harbor act approved July 25, 1912	352,250.00
Amount available for fiscal year ending June 30, 1913	599,484.76
July 1, 1912, amount covered by uncompleted contracts	190,146.05
Amount (estimated) required to be appropriated for completion of existing project	[3] 121,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[3] 121,000.00

(See Appendix Q Q 2.)

3. San Luis Obispo Harbor, Cal.—San Luis Obispo Harbor is 9 miles to the southward and westward of the town of San Luis Obispo, 216 nautical miles south of San Francisco, and 177 nautical miles north of Los Angeles Harbor.

It is a bight of the coast about 18 miles long between Point San Luis on the north and Point Sal on the south. Port San Luis (formerly Port Harford) is situated at its upper end, where a commercial wharf has been maintained for many years. In 1907 commercial wharves were built also at Avila and at Oilport, just easterly of Avila. The latter wharf, however, was destroyed shortly after it was built.

Whaler Reef, extending nearly half a mile to the southward and eastward of Point San Luis, forms more or less of a natural breakwater, but during the winter season the landing was exposed to the heavy swell caused by southerly gales.

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[1] Exclusive of the balance unexpended July 1, 1912.
[2] Including appropriation for improving harbor at San Pedro, Cal.
[3] Exclusive of amount available for fiscal year 1913.

The original project was adopted by the river and harbor act of August 11, 1888, and provided for the construction on Whaler Reef of a breakwater of rubblestone rising to mean lower low water and extending from Point San Luis to Whaler Island, a distance of 336 feet, and thence to a point where the outer reef rises above high water. Exclusive of Whaler Island, which is 245 feet long, the breakwater was to have a length of about 1,736 feet, and its estimated cost was $284,898.

The project (with map) is printed in Senate Document No. 81, Forty-ninth Congress, second session, and (without map) in Annual Report of the Chief of Engineers for 1887, page 2433 et seq.

This project was modified January 17, 1893, to provide for raising the structure to the height of 6 feet above mean high water, with a top width of 20 feet and such side slopes as might be formed under the action of the sea. The estimated cost was increased to $568,660. In 1898 the line of the breakwater was deflected about 11° toward the harbor.

The existing project, therefore, is the construction of a breakwater from Point San Luis to Whaler Island, and from Whaler Island extending southeasterly a distance of about 1,800 feet, the breakwater to be built to the height of 6 feet above mean high water, with a top width of 20 feet and such side slopes as may be formed under the action of the sea.

The river and harbor act of March 2, 1907, appropriated $63,660 and authorized continuing contracts for the completion of the work at a cost not to exceed the additional amount of $200,000, of which $46,000 remains to be appropriated.

A continuing contract for completing the breakwater has been entered into which provides for the delivery of 151,140 tons of stone at $1.57 per ton, the amount necessary to complete the project. Work was to have been begun May 1, 1908, but on account of the shoaling of the channels at the quarry at Morro Rock and the heavy seas no stone was delivered until August, 1908, and only 9,205 tons up to December, 1908, when work was suspended for the winter. The shoaling at the quarry so increased that barges could not load at the quarry. As this is the only available quarry, authority was given the contractors to suspend work during the working season of 1909.

On June 3, 1910, the Secretary of War authorized the contractors to close so much of the entrance channel on the north side of Morro Rock as might be necessary to open the south channel. Work under this permission was begun immediately. A trestle 1,571 feet long was built from Morro Rock to the mainland, along which was placed 10,825 cubic yards of stone from the quarry. This work was completed August 7, 1910. The south channel has gradually deepened until at present there is a channel 20 feet deep at the quarry and 10 feet on the bar at the entrance.

There has been placed in the breakwater 223,235 short tons of stone, of which amount 86,351 tons has been placed under the present contract and 60,309 tons during the fiscal year.

The amount expended on this project up to June 30, 1912, is $431,144.81. Of this amount $86,931.22 was expended during the year. The project is 77 per cent completed.

The breakwater has been built to full section from Point San Luis to Whaler Island, a distance of 336 feet, and for 620 feet outside of Whaler Island, and has been partly built up for 1,230 feet farther, or a total distance of 2,431 feet, including the island. The partially protected area has an available depth of 20 to 33 feet at mean lower low water, and there is 25 feet depth at the Port San Luis Wharf. The mean rise of tide is 4.6 feet. The result has been to give increased security to vessels in the anchorage and at the landing.

The commerce of this port for the year 1911 amounted to 1,534,984 short tons, an increase of 30 per cent over that for 1910. Its estimated value was $9,713,107. It consisted principally of crude oil, asphaltum, lumber, grain, beans, and general merchandise. There are four oil-pipe lines terminating at this port and coming from the Santa Barbara and San Joaquin fields. Oil is shipped from here by the Union, Standard, and Associated Oil companies to Pacific coast points of North and South America, and also to Honolulu. The regular oil fleet of the port consists of 23 vessels and barges, about half of which have a capacity of 50,000 barrels each. Since the breakwater has been built to sufficient length and height to enable deep-draft vessels to lie at the wharf, there have been considerable changes in freight rates, but it is impracticable to state what influence the harbor work has had in these changes. Formerly the rate on crude oil from Port San Luis to San Francisco was 42½ cents per barrel; it is now 10 cents. About 9,000,000 barrels were shipped during the year. The railroad rate is about 38 cents. The water rate on grain and beans, formerly $3.25 per ton, is now $3 for grain and $3.20 for beans. The rate on asphaltum from Port San Luis to Seattle has fallen from $2.90 per ton to $2.55 per ton.

Further work under the project will afford increased shelter. The unexpended balance and the $46,000 yet to be appropriated should be applied to the extension of the breakwater to its full projected length and height.

July 1, 1911, balance unexpended	$178,447.36
June 30, 1912, amount expended during fiscal year, for works of improvement	86,931.22
July 1, 1912, balance unexpended	91,516.14
July 1, 1912, outstanding liabilities	8,515.46
July 1, 1912, balance available	83,000.68
July 1, 1912, amount covered by uncompleted contracts	113,812.93
Amount of continuing contract authorization, act of Mar. 2, 1907	200,000.00
Amount appropriated under such authorization	154,000.00
Amount yet to be appropriated	46,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 46,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 46,000.00

(See Appendix Q Q 3.)

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[1] Exclusive of the balance unexpended July 1, 1912.

EXAMINATION MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Report, dated October 14, 1910, on preliminary examination of *Los Angeles (San Pedro) Outer Harbor, Cal., with a view to obtaining an increased depth*, required by the river and harbor act approved June 25, 1910, was duly submitted by the district officer. It was reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and was transmitted to Congress and printed in House Document No. 267, Sixty-second Congress, second session. The improvement by the United States of this locality further than is provided for in the existing project is not deemed advisable at the present time.

In compliance with resolution of the Committee on Rivers and Harbors of the House of Representatives, reports dated April 3 and 10, 1912, of a reexamination of the locality by the district officer, and reports of review by the Board of Engineers for Rivers and Harbors, dated April 9 and 11, 1912, are printed in Rivers and Harbors Committee Document No. 8, Sixty-second Congress, second session. On account of a change in local conditions, as set forth in the reports, a plan of improvement at an estimated cost of $327,250 is presented.

EXAMINATION MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Report dated July 28, 1911, on preliminary examination of *Santa Barbara Harbor, Cal.*, required by the river and harbor act approved February 27, 1911, was duly submitted by the district officer. It was reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and was transmitted to Congress and printed in House Document No. 464, Sixty-second Congress, second session. The improvement of this locality by the United States as proposed is not deemed worthy of being undertaken at the present time.

The local officer was also charged with the duty of making a preliminary examination and survey, provided for by the river and harbor act approved February 27, 1911, of *Newport Harbor, Cal.*, and reports thereon will be duly submitted when received.

IMPROVEMENT OF RIVERS AND HARBORS IN THE FIRST SAN FRANCISCO, CAL., DISTRICT.

This district was in charge of Col. John Biddle, Corps of Engineers, division engineer, Pacific Division, to July 20, 1911; of Lieut. Col. Thomas H. Rees, Corps of Engineers, division engineer, Pacific Division, from July 20, 1911, to June 21, 1912; and of Maj. S. A. Cheney, Corps of Engineers, from June 21, 1912, to June 30, 1912.

1. Harbor at San Francisco, Cal.—San Francisco Bay is about 40 miles long and varies from 3 to 10 miles in width, and has about 36 square miles of anchorage area with depths of from 40 to 90 feet. The bar extending around the entrance has a depth in Bonita Channel of about 8 fathoms and at other channels 5 to 6 fathoms.

The only impediments to navigation, with which the General Government concerned itself, were a number of rocks scattered about the bay and in the ocean, interfering with safe and easy navigation. The rocks above high water have been marked by buoys, lighthouses, etc. Of the rocks below high water some were above low water and others ranged from being barely covered at low water down to a depth of 25 to 30 feet below low water. These rocks obstructed navigation in varying degrees according to their location, the depth of water over them, and the draft of vessels using the channels. Rocks out of the way of the deepest-draft vessels using the channels in which the rocks are located have not been considered. The plane of reference is mean lower low water.

The original project was adopted in 1868 and enlarged in 1872. The whole improvement contemplated the removal of Blossom Rock and Rincon Rock each to a depth of 24 feet at mean lower low water.

The total amount spent prior to operations under existing project was $165,927.84.

The existing project, adopted by Congress on March 3, 1899, provided for the removal of Arch Rock and Shag Rocks Nos. 1 and 2, all to a depth of 30 feet below mean lower low water. Congress at that time appropriated $100,000 for the work and authorized continuing contracts for not to exceed $500,000 additional. The estimated cost of removal of these three rocks was $731,220.

On June 13, 1902, Congress amended the act of March 3, 1899, so as to include the removal of Blossom Rock to a depth of 30 feet. The estimate of cost was $92,600. These four rocks were removed under two contracts and work was completed in 1903, at a total contract price of $298,642.

On June 25, 1910, Congress revived the continuing-contract authorization of March 3, 1899, and extended it to include the removal of Centissima Rock, Bonita Channel, to a depth of 40 feet at mean lower low water, at an estimated cost of $110,000; and two rocks near the Mail Dock to 35 feet below mean lower low water, at an estimated cost of $60,000, in accordance with plan printed in House Document No. 1119, Sixtieth Congress, second session.

The present project is based on the following reports:

Annual Reports of Chief of Engineers for 1895, page 3254, and 1898, page 2924, which contains no maps; House Document No. 101, Fifty-sixth Congress, first session; and House Document No. 1119, Sixtieth Congress, second session, which contain maps.

The existing project provides for the removal of Centissima rock, Bonita channel, to a depth of 40 feet, at an estimated cost of $110,000, and two rocks near the Mail Dock, called Rincon Reef rocks, to 35 feet below mean lower low water, at an estimated cost of $60,000, in accordance with plan printed in House Document No. 1119, Sixtieth Congress, second session.

The work of removal of Rincon Reef rocks has been carried on during the year under contract. A total of about 2,600 cubic yards of rock has been removed above the grade plane. This is all new work, and the expenditure was $9,863.57.

The amount expended on existing project up to June 30, 1912, was $326,393.65. Nothing has been spent for maintenance and no receipts have been derived from any source. An unexpended balance of $3,470.32 was turned into the Treasury of the United States, on June 30, 1908.

The improvement is now covered by the continuing-contract appropriations, and the balance of the authorization remaining to be appropriated is $250,000.

About nine-tenths of the approved project, including all extensions to date, has been completed up to June 30, 1912, including removal of Shag Rocks Nos. 1 and 2, Arch Rock and Blossom Rock to a depth of 30 feet, and the inner Rincon Reef Rock to a depth of 35 feet.

The maximum draft that can be carried June 30, 1912, over the rocks that have been under improvement, except Rincon Rock, is 30 feet at mean lower low water. The tidal range is from 3½ to 6 feet. These improvements have resulted in making navigation easier and safer. The maximum draft that can enter the harbor is determined by the bar, which has a channel of 8 fathoms.

A draft of 35 feet can be carried over the inner Rincon Reef Rock.

The total exports and imports for the port of San Francisco for the year ending December 31, 1911, amounted to $262,688,069, and consisted of millstuffs, lumber, building materials, crude oil, fuel, fruit, vegetables, groceries, Chinese merchandise, and miscellaneous articles. The commerce of San Francisco is increasing. The improvements have had no appreciable effect on freight rates.

The amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied to the removal of Centissima rock and this work is for the purpose of extension of benefits.

July 1, 1911, balance unexpended	$29,999.60
June 30, 1912, amount expended during fiscal year, for works of improvement	9,863.57
July 1, 1912, balance unexpended	20,136.03
July 1, 1912, outstanding liabilities	5,004.72
July 1, 1912, balance available	15,131.31
July 1, 1912, amount covered by uncompleted contracts	9,729.40
Amount of continuing-contract authorization, acts of March 3, 1899, and June 25, 1910	500,000.00
Amount appropriated under such authorization	250,000.00
Amount yet to be appropriated	250,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 140,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 100,000.00

(See Appendix R R 1.)

2. Redwood Creek, Cal.—Redwood Creek empties into San Francisco Bay about 25 miles south of San Francisco. Before improvement there were shoals in this creek which were bare at low tide, and vessels used it only during medium stages of the tide.

The channel was from 80 to 400 feet wide. The plane of reference is mean lower low water.

The original project was adopted in 1882 to dredge a channel about 6,000 feet long, 50 to 60 feet wide, and 2 to 3 feet deep. In 1902 this project was modified to provide for a channel depth of 5 feet and certain works to confine the current. The total amount spent prior to adoption of present project was $31,442.66. An unexpended balance of $357.34 was turned into the Treasury of the United States on June 30, 1908.

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[1] Exclusive of the balance unexpended July 1, 1912.

The present project, adopted by Congress in the river and harbor act approved June 25, 1910, provides for a channel 150 feet wide and 5 feet deep at mean lower low water up to the city dock, about three-fourths of a mile below Redwood City. The estimated cost is $12,000, with $1,500 annually thereafter for maintenance.

For report of examination and survey upon which the project is based, see House Document No. 307, Sixty-first Congress, second session, which contains a map of the locality.

No modification has been made in existing project since its adoption.

During the early part of the fiscal year the work of dredging out the creek under contract was completed. A total of 36,101 cubic yards of material was removed during the year. This was partly new work and partly renewal of work done under the old project.

The total expenditures during the year were $7,128.92, and the total amount spent on existing project to date is $10,320.80. Nothing has been received from sales or other sources.

The present project was entirely completed early in the fiscal year. and the result is a channel 150 feet wide and 5 feet deep from San Francisco Bay to the city dock. This channel is wider than is required by existing or prospective commerce, but it does not extend to the head of navigation. Private parties have dredged a channel 50 feet wide and 4 feet deep from the city dock to the head of navigation at Redwood City.

The maximum draft that can be carried June 30, 1912, over the shoalest part under the project is 5 feet at mean lower low water. The tidal range is about 8 feet. The project is wholly completed and the head of navigation is Redwood City.

The amount of commerce carried on Redwood Creek during the year ending December 31, 1911, is given as 51,495 short tons, valued at $860,810. This shows a decrease over the amount reported for the preceding year.

The effect of the improvement of this stream by the United States has been to secure the so-called "railroad terminal rates" for Redwood City, the railroad rates being as low as water rates.

The amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied to dredging, and this work is necessary to make the present improvement available.

July 1, 1911, balance unexpended	$8,808.12
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	7,128.92
July 1, 1912, balance unexpended	1,679.20
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 3,000.00

(See Appendix R R 2.)

3. Oakland Harbor, Cal.—Oakland Harbor in its original condition was a tidal estuary connecting San Francisco Bay with a tidal basin. There was an available channel 500 feet wide and 2 feet deep, and commerce was possible only at higher stages of the tide. The plane of reference is mean lower low water. The length of the estuary to the tidal basin is 4¾ miles, and the channel around the tidal basin is about 2⅜ miles long. The channel through the tidal canal is about 2¼ miles long. This locality is adjacent to the harbor of San Francisco and lying to the east thereof.

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[1] Exclusive of the balance unexpended July 1, 1912.

The original project was submitted in 1874 and provided for two training walls at the entrance, a canal connecting the tidal basin with San Leandro Bay, a dam in San Leandro Bay, and dredging the tidal basin and deepening the channel through the estuary to San Francisco Bay. This project was modified in 1902 and again in 1907.

The amount spent on original and modified projects prior to operations under existing project was $3,420,965.54.

The river and harbor act of June 25, 1910, provided for either continuing work under the above project or, in the discretion of the Secretary of War, improving in accordance with plan of improvement printed in House Document No. 647, Sixty-first Congress, second session. On July 25, 1910, the Secretary of War designated the latter project as the one that should be adopted. This project provides for a channel 500 feet wide and 30 feet deep from the bay to the tidal basin, 300 feet wide and 25 feet deep around the tidal basin, and 18 feet deep in the tidal canal, at an estimated cost of $1,100,000. and $25,000 annually for maintenance.

The project is based upon the document mentioned above, which does not contain any map.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entire work [1]					1874(Pt.II)	[illegible]
Do.[2]					1896	[illegible]
Do.[1]					1901	[illegible]
Do.[1]	House	262	Fifty-sixth	Second		
Do.[1]	do	647	Sixty-first	do		

[1] No map. [2] Contains map.

The existing project has not been modified since its adoption.

One dredging plant has been engaged throughout the year widening and deepening the lower part of the main channel and a second dredging plant has worked about seven months along the same part of this channel. A total of 1,136,117 cubic yards of material was excavated.

The three drawbridges across the tidal canal have been overhauled and repaired and equipped with electrical machinery for operating the draws.

All the above work was done under contracts.

The total expenditures for the year were $134,249.95. The total expenditures on existing project to June 30, 1912, were $197,670.93. It is impossible to segregate the amount spent for maintenance from the total expenditures, because maintenance work is done simultaneously with deepening the channel, which is new work. The sum of $195.35 was received from the sale of old typewriters, etc., $133.42 was received by reimbursement from Isthmian Canal Commission, and $19.98 was received by reimbursement from Department of Commerce and Labor.

The approved project was 17.5 per cent completed June 30, 1912. The results accomplished to date are a completed channel 30 feet deep extending westerly from the Webster Street drawbridge for a distance of 11,800 feet and varying in width from 300 to 500 feet. The maximum draft that can be carried June 30, 1912, is 23 feet from the entrance of the jetty channel for a distance of 4,500 feet; thence to Webster Street 30 feet; thence to the tidal basin 23 feet; thence around north channel of tidal basin 11 feet; and around south channel of tidal basin 13 feet; and through the tidal canal 10 feet.

The range of tides is from 3 to 7 feet.

The length of the improved channel from San Francisco Bay to the tidal basin is about 4¾ miles, and the length of the channel around the tidal basin is about 2⅜ miles. The length of the channel in the tidal canal is about 2¼ miles.

The total exports and imports by vessels and ferries for the calendar year 1911 was 3,796,683 short tons, valued at $154,224,950. This commerce consists of lumber, building materials, farm products, crude oil, fuel, and general merchandise.

It is difficult to estimate what increase of commerce is likely to result from an increased depth and width of channel in Oakland Harbor. At present about 64 per cent of the total tonnage of Oakland Harbor is overland freight transferred across the bay on ferryboats, which, when loaded with cars, draw only about 8 feet of water. If improvement be continued it will permit the deeper-draft vessels to carry to and from Oakland merchandise which now is transported over the ferries. It also should induce an increase in manufacturing industries on the shores of this harbor.

It is believed that the improvement has had no material effect on freight rates.

The funds remaining available on June 30, 1913, and the additional appropriation asked for, will be expended during the fiscal year 1914 in continuing the improvement, or in the purchase of a dredge if bids received are not reasonable. This will be for extension of benefits and for removing shoals that have developed in the channel since it was previously dredged.

July 1, 1911, balance unexpended		$349, 469. 09
Miscellaneous receipts		296. 14
		349, 765. 23
June 30, 1912, amount expended during fiscal year:		
Treasury settlements	$1. 20	
For works of improvement	134, 248. 75	
		134, 249. 95
July 1, 1912, balance unexpended		215, 515. 28
July 1, 1912, outstanding liabilities		15, 861. 75
July 1, 1912, balance available		199, 653. 53
Amount appropriated by river and harbor act approved July 25, 1912		130, 000. 00
Amount available for fiscal year ending June 30, 1913		329, 653. 53

July 1, 1912, amount covered by uncompleted contracts	$190,362.56
Amount (estimated) required to be appropriated for completion of existing project	[1] 575,481.65
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 275,000.00

(See Appendix R R 3.)

4. *San Pablo Bay, Cal.*—San Pablo Bay is 12 miles long by 6 miles wide and is about 10 miles northeast of San Francisco Harbor. Before improvement there was a shoal with a least depth of 19 feet at mean lower low water, lying across the path of vessels going to and from the Sacramento and San Joaquin Rivers and Mare Island Navy Yard. For the deeper-draft vessels navigation was possible only at the highest stages of the tide. The plane of reference is mean lower low water.

The original project was adopted June 13, 1902, and provided for a channel 300 feet wide, 30 feet deep, and 27,000 feet long across the shoal in the bay.

A total of $335,165.33 was spent on original project prior to operations under present project.

The existing project, adopted February 27, 1911, provides for dredging the channel in San Pablo Bay to a width of 500 feet and depth of 30 feet, and for a dredge for maintenance. The project is based on report contained in House Document No. 1103, Sixtieth Congress, second session, which contains maps. The total estimated cost of the War Department part of the project is $760,000, with $100,000 annually for maintenance. There has been no modification in the existing project since its adoption.

A dredging plant has been constantly engaged under contract dredging out the channel since October, 1911. A total of 561,195 cubic yards of material was excavated and properly deposited, and the total expenditure during the fiscal year was $82,223.09.

The total amount expended on the existing project to June 30, 1912, was $82,234.65, no part of which was for maintenance of present project, and nothing has been received from sales or other sources.

The work of dredging is being done under continuing contract appropriations, and the amount remaining to be appropriated is $238,000.

The work in progress consists of dredging a channel through Pinole Shoal over a length of 27,000 feet. The approved project was 16.65 per cent completed on June 30, 1912.

The result accomplished is a channel 500 feet wide and 30 feet deep throughout the first section of 5,000 feet, beginning at a point 7,300 feet north of Pinole Point, and in addition a channel 305 feet wide and 30 feet deep throughout the second section of 5,000 feet. The available depth in the first and second sections is 30 feet and 24-foot depths in the other three sections. The ordinary range of tides is from 3.5 to 6.5 feet.

Improvement is needed to permit naval vessels to reach Mare Island Navy Yard at all stages of the tide. It is not required by the present commerce, and has had no effect on freight rates.

The funds estimated for expenditure in the fiscal year ending June 30, 1914, will be used to complete dredging under contract and for maintenance work with Government plant. This will be partly new work and partly renewal of old work.

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[1] Exclusive of amount available for fiscal year 1913.

July 1, 1911, balance unexpended	$417,991.52
June 30, 1912, amount expended during fiscal year, for works of improvement	82,223.09
July 1, 1912, balance unexpended	335,768.43
July 1, 1912, outstanding liabilities	30.00
July 1, 1912, balance available	335,738.43
Amount appropriated by sundry civil act, approved Aug. 24, 1912	122,000.00
Amount available for fiscal year ending June 30, 1913	457,738.43
July 1, 1912, amount covered by uncompleted contracts	390,828.77
Amount of continuing contract authorization, act of Feb. 27, 1911	360,000.00
Amount appropriated under such authorization	122,000.00
Amount yet to be appropriated	238,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 238,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	238,000.00
For maintenance of improvement	40,000.00
Total	[1] 278,000.00

(See Appendix R R 4.)

5. *Suisun Channel, Cal.*—Originally Suisun Channel was a tidal inlet from Suisun Bay, Cal., varying in width from 80 to 600 feet and varying in depth from zero to 17 feet at mean lower low water. Navigation was possible only at the higher stages of the tide. Suisun Channel is about 17 miles long and is about 30 miles northeast of San Francisco Harbor.

The original (the present project) was adopted by Congress in river and harbor act of June 25, 1910, is in accordance with plan printed in House Document No. 1110, Sixtieth Congress, second session, and provides for a harbor at Suisun 1,400 feet long by 150 feet wide and 6 feet deep at mean lower low water, and a cut-off 3,000 feet long, 80 feet wide on the bottom, and 6 feet deep at mean lower low water, from the basin to Peytonia Slough. The estimated cost is $25,000, and $2,000 annually for maintenance. The said act makes an appropriation of $12,500 and further provides that the land required for the cut-offs proposed shall be deeded to the United States, free of cost, before any part of the appropriation shall be expended.

This project has not been modified since its adoption.

During the year title was obtained to the necessary land for the cut-off contemplated by the project. The work of making the cut-off was begun in March, 1912, under contract. The material encountered was so soft that the banks could not be made to stand with the excavated material placed upon them. The contractor withdrew his dredge and had not done anything further on the work at the end of the fiscal year.

This is all new work and a total of $133.55 was expended during the year.

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[1] Exclusive of amount available for fiscal year 1913.

The initial work on the existing project was begun during the fiscal year and all expenditures have been applied to new work. There have been no receipts from sales and no reimbursements during the year.

No appreciable work has been done on project yet.

The shoalest parts of this channel were dry at low water on June 30, 1912. The tidal range is about 7 feet. The head of navigation is Suisun, Cal., and the length of the navigable portion is 17 miles.

The commerce of Suisun Channel for the year ending December 31, 1911, is given as 83,444 tons, valued at $535,726, and consists mainly of grain, lumber, building materials, canned goods, crude oil, and wool.

It is thought that the improvement when completed will cause a reduction in freight rates by affording competition with the railroads.

The amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, will be used to complete the cut-off and excavate a harbor at the town of Suisun, and for maintenance.

In view of the difficulties encountered in making the cut-off contemplated by the adopted project, it may prove desirable to secure the increased depth by way of the natural channel or other route, and it is recommended that authority be granted to modify the project in this particular should further investigation show the present lay-out to be impracticable on account of excessive cost.

July 1, 1911, balance unexpended	$12,500.00
June 30, 1912, amount expended during fiscal year, for works of improvement	133.55
July 1, 1912, balance unexpended	12,366.45
July 1, 1912, amount covered by uncompleted contracts	6,836.03
Amount (estimated) required to be appropriated for completion of existing project	[1] 12,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 14,500.00

(See Appendix R R 5.)

6. Petaluma Creek and Napa River, Cal.—(a) Petaluma Creek.—Before improvement this creek was very crooked, dry in many places at low tide, and could be navigated only at the higher stages of the tide. The channel was from 80 to 600 feet wide. The plane of reference is mean lower low water.

The original project was adapted in 1880 and provided for cut-offs and dredging to obtain a channel 50 feet wide and 3 feet deep. In 1892 this was modified so as to provide a channel as deep as funds would permit. The amount expended on original and modified projects prior to operations under present project was $67,808.52.

The existing project, adopted by Congress March 2, 1907, provides for dredging a channel 6 feet deep and 50 feet wide from the mouth to McNears Canal, and 4 feet deep and 50 feet wide thence to the head of navigation. The estimate of cost was $15,239. The project is based on report contained in House Document No. 387, Fifty-ninth Congress, first session, which contains a map.

The existing project has not been modified since its adoption.

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[1] Exclusive of the balance unexpended July 1, 1912.

Work was begun in May, 1912, dredging a channel across the flats in San Pablo Bay, at the mouth of Petaluma Creek. This work was completed June 3, 1912, and was done under contract. A total of 247,340 cubic yards of material was thus excavated and the total expenditures for the year were $25,248.56, of which $15,354.40 was from the appropriation for emergencies in river and harbor works, act of March 3, 1909.

The total amount expended on the existing project up to June 30, 1912, was $56,784.88; of this amount $14,378.65 has been spent for maintenance. There have been no receipts from any source.

The approved project was completed in 1907 and all work done since has been for maintenance of the authorized width and depths of channel. The maximum draft that can be carried June 30, 1912, over the shoalest part under improvement is 1 foot in the upper section and 4 feet in the lower sections at mean lower low water. The tidal range is about 8 feet and the improved portion is about 18 miles long, exclusive of the work in San Pablo Bay outside of the mouth of the creek. The head of navigation is the town of Petaluma.

The commerce of the creek for the year ending December 31, 1911, is given as 223,403 tons, valued at $12,338,340, and consists mainly of grain, mill stuffs, eggs, wines, liquors, and general merchandise.

It is considered that water transportation has aided largely in the development and prosperity of the contiguous country and has effected a material reduction in freight rates.

The amount estimated as a profitable expenditure in fiscal year 1914 will be applied to maintenance, and is necessary to make the present improvement available.

July 1, 1911, balance unexpended		$9,894.16
Feb. 17, 1912, special allotment from emergency appropriation, act Mar. 3, 1909		16,659.00
		26,553.16
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$25,096.14	
For maintenance of improvement	152.42	
		25,248.56
July 1, 1912, balance unexpended		1,304.60
Amount appropriated by river and harbor act approved July 25, 1912		6,000.00
Amount available for fiscal year ending June 30, 1913		7,304.60
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		(1)

(*b*) *Napa River.*—Napa River has its source in the St. Helena Mountains and it empties into Mare Island Strait, an arm of San Pablo Bay. Napa River has a length of about 45 miles and flows generally in a southeasterly direction. The section included in the project is the lower 18 miles of the river. Before improvement the river had a low-water depth of 5 feet for the first 12 miles above the mouth and about 1 foot depth to the crest of the bars in the next 6 miles to the head of navigation. The river was from 125 to 300 feet in width along the navigated section. The plane of reference is mean lower low water. Before improvement navigation was possible only at the higher stages of the tide.

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[1] See consolidated money statement on p. 1161.

A project for the improvement of this river was adopted in 1888, and provided for dredging, and cutting off projecting points of land so as to obtain a channel 75 feet wide and 4 feet deep, and to remove logs, snags, and other obstructions, at an estimated cost of $27,600. This project has not been modified since its adoption.

The existing project is given in preceding paragraph and is based on report contained in Annual Report of Chief of Engineers for 1885, page 2343, which does not contain a map.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to head of navigation [1]					1896	3236
Do.[1]					1896	3277
Do.[1]					1897	3324
Do.[1]					1900	4253
Do.	House	48	Fifty-sixth	First		
Do.[1]					1904	3427
Do.[1]	House	178	Fifty-eighth	Second		

[1] No maps.

During the year 24,456 cubic yards of material was dredged from the channel of this river, 79 stumps, logs, and snags, 47 old piles, and 62 lineal feet of sheet piling obstructing navigation were removed. This work was all done by contract, and a total of $3,651.56 was expended during the year. This work was all for maintenance.

The total amount expended on this improvement to June 30, 1912, is $46,876.06. Of this amount, $19,276.06 has been spent for maintenance of improvement.

The sum of $19.45 was received by way of reimbursement from the Isthmian Canal Commission and $25 from the Department of Commerce and Labor.

The full width and depth of the authorized channel is now generally available for vessels. The maximum draft that can be carried June 30, 1912, over the shoalest part under improvement is 3 feet at mean lower low water. The ordinary range of tides is about 5 feet; spring tides reach a height of 7 feet. The length of the improved section is 18 miles and the head of navigation is the city of Napa.

The commerce of Napa River during the year 1911 amounted to 207,709 tons, valued at $9,753,505, and consists mainly of lumber, mill stuffs, building materials, wines, hides, live stock, and general merchandise.

The effect of the improvement has been to secure and maintain reasonable freight rates.

The amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied to dredging, and is necessary to make the present improvement available and also for the purpose of extension of benefits.

July 1, 1911, balance unexpended	$10,704.86
Miscellaneous receipts	44.45
	10,749.31

June 30, 1912, amount expended during fiscal year, for maintenance of improvement		$3,651.56
July 1, 1912, balance unexpended		7,097.75
Amount appropriated by river and harbor act approved July 25, 1912		3,000.00
Amount available for fiscal year ending June 30, 1913		10,097.75
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		([1])

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July 1, 1911, balance unexpended		20,599.02
Miscellaneous receipts		44.45
February 17, 1912, special allotment from emergency appropriation, act March 3, 1909		16,659.00
		37,302.47
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$25,096.14	
For maintenance of improvement	3,803.98	
		28,900.12
July 1, 1912, balance unexpended		8,402.35
Amount appropriated by river and harbor act approved July 25, 1912		9,000.00
Amount available for fiscal year ending June 30, 1913		17,402.35
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[2] 18,000.00

(See Appendix R R 6.)

7. *Harbor at Monterey, Cal.*—No work has ever been done by the United States toward the improvement of this locality. The harbor is about 3,000 feet long by about 1,700 feet wide and the depths vary from 18 feet in the inner part to 60 feet at the outer part. The plane of reference is mean lower low water. This harbor is about 125 miles south of San Francisco. The harbor facilities are generally sufficient for present commerce except in the matter of protection from storms and heavy ocean swells. The shipping facilities are inadequate for prospective commerce.

The present project, adopted July 25, 1912, is the original project. Nothing has been spent on this work as yet.

The existing project provides a method of improvement by a breakwater 2,000 feet long, 10 feet above mean lower low water, and 15 feet wide at the top, at an estimated cost of $800,000, of which $200,000 is to be contributed by local interests, and subject to the condition that rail connection be provided between Monterey and San Joaquin Valley within a reasonable time. This was adopted July 25, 1912, and is based on reports contained in House Document No. 1084, Sixty-first Congress, third session, and House Document No. 557, Fifty-ninth Congress, first session, neither of which contains a map. The only other report on this locality is that of a preliminary examination contained in the Annual Report of the Chief of Engineers for 1875, Part II, page 707, which does not contain any map.

There has been no modification in the existing project since its adoption.

Nothing was done during the year at this locality and no expenditures were made.

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[1] See consolidated money statement on this page.

[2] Exclusive of amount available for fiscal year 1913.

The maximum draft that can be carried June 30, 1912, at the wharf is 24 feet at mean lower low water. The mean tidal range is 3.4 feet. The head of navigation is the city of Monterey.

The commerce at the locality is reported as amounting to 615,014 short tons in 1911, valued at $2,531,406, and it consists mainly of crude oil.

From present prospects there will be some delay in making compliance with the conditions imposed upon local interests by the act of Congress carrying the present appropriation. As no work can be undertaken until these conditions are fulfilled it is impossible at present to estimate for a profitable expenditure during the fiscal year ending June 30, 1914.

Amount appropriated by river and harbor act approved July 25, 1912	$200,000.00
Amount available for fiscal year ending June 30, 1913	200,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 400,000.00

(See Appendix R R 7.)

8. *Humboldt Harbor and Bay, Cal.*—Before improvement the entrace to the harbor was obstructed by a bar having channel depths of 12 to 15 feet. This channel was not fixed in direction and was not straight. The channel had a width of about 600 feet generally. The plane of reference is mean lower low water. Navigation with the deeper draft vessels was generally limited to higher stages of the tides and to favorable conditions of the wind and weather. This locality is about 272 miles north of San Francisco.

(*a*) *Rebuilding jetties.*—A project for the improvement of the harbor entrance was made in 1882, and provided for a single low south jetty 6,000 feet in length; this was modified in 1888 and again in 1891, so as to provide for parallel high jetties, each about 8,000 feet in length. The amount expended on original and modified projects, including the channel in front of Eureka, prior to operations under existing project, was $2,178,704.14.

The present project provides for rebuilding the jetties in accordance with the report submitted in House Document No. 950, Sixtieth Congress, first session, at an estimated cost of $1,037,400. The document referred to does not contain a map. This project was adopted June 25, 1910.

The existing project has not been modified since its adoption.

During the year a stone receiving and handling plant was installed by hired labor at a cost of $94,275; a total of 27,597.86 tons of stone of three classes were delivered by contract, received and placed on the south jetty with the Government plant and by hired labor. This work was all rebuilding the old south jetty. A total of $164,449.67 was expended during the year.

A total of $170,895.20 was expended on the existing project up to June 30, 1912, and this was all for new work under the present project. The sum of $6 has been received from the sale of unserviceable articles, $44.48 has been received by way of reimbursement from the Isthmian Canal Commission, and $5.58 by way of reimbursement from the Department of Commerce and Labor.

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[1] Exclusive of amount available for fiscal year 1913 and the funds to be contributed by local interests.

This work is in progress under the continuing-contract appropriations, and the balance of the authorization remaining to be appropriated is $467,400.

The approved project was 16.30 per cent completed on June 30, 1912, but the work of rebuilding the jetties has not progressed sufficiently yet to have any great effect on the entrance channel. The maximum draft that can be carried June 30, 1912, over the shoalest part of the channel is 21 feet at mean lower low water. The tidal range is about 6 feet. The length of the jetty channel is 1⅝ miles, and the head of navigation is principally at Eureka, although considerable lumber shipments originate at Arcata and Samoa.

The commerce for 1911 was about 641,457 short tons of exports, valued at $9,609,760, and 129,103 short tons of imports, valued at $5,799,100.

The improvement has doubtless had a tendency to maintain reasonable freight rates, but there is no connection by rail with other ports, and therefore no competition with railroads.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to rebuilding the jetties, and is necessary for the purpose of extension of benefits.

Since the date of preparation of the estimates for 1914 report has been received from the local officer that on account of increase in the cost of rock and greater quantities required than contemplated at the time the original estimate was submitted it now appears that the continuing-contract authorization made by the act of 1911 will not be sufficient to complete the project. In order that the work may be prosecuted economically and advantageously an additional amount of $150,000 should be made immediately available and the appropriation of this sum in the next river and harbor act is recommended.

July 1, 1911, balance unexpended	$322, 471. 33
Miscellaneous receipts	50. 06
	322, 521. 39
June 30, 1912, amount expended during fiscal year, for works of improvement	164, 449. 67
July 1, 1912, balance unexpended	158, 071. 72
July 1, 1912, outstanding liabilities	16, 592. 87
July 1, 1912, balance available	141, 478. 85
Amount appropriated by sundry civil act, approved August 24, 1912	250, 000. 00
Amount available for fiscal year ending June 30, 1913	391, 478. 85
July 1, 1912, amount covered by uncompleted contracts	686, 378. 71
Amount of continuing contract authorization, act of February 27, 1911	717, 400. 00
Amount appropriated under such authorization	250, 000. 00
Amount yet to be appropriated	467, 400. 00
Amount (estimated) required to be appropriated for completion of existing project	[1] 467, 400. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 300, 000. 00

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[1] Exclusive of amount available for fiscal year 1913.

(*b*) *Channel in front of Eureka.*—In its original condition the ship channel in front of Eureka had a least depth of 10 feet at mean lower low water, the plane of reference. This channel is in Humboldt Bay, which has a length of 10½ miles and an average width of three-fourths of a mile. The Eureka channel is about 5 miles from the jetty channel at the entrance to Humboldt Bay. Originally navigation was limited to the higher stages of the tide.

The original project was adopted in 1881, and provided for a channel 200 feet wide and 12 feet deep. This was modified in 1899 to provide a channel of the same width 8,900 feet long and 15 feet deep. The total amount expended on original and modified projects prior to operations under present project is included in the amount spent on the jetties and can not be separated from it.

The existing project provides for a channel 300 feet wide, 18 feet deep, and 6,200 feet long. The estimate of cost was $83,000, and the project was adopted by Congress on March 2, 1907. This project is based on survey report printed in House Document No. 228, Fifty-ninth Congress, first session, which contains a map.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Channel in front of Eureka [1]					1881	2461
Do.[1]					1897	3377
Do.[2]	House	228	Fifty-ninth	First		

[1] No maps.

[2] Contains maps.

The project has not been modified since its adoption.

The only work done during the year was to make a survey to determine the extent of shoaling that had taken place. The amount of funds on hand being insufficient for accomplishing any practical results, no work was undertaken. A total of $2,226.20 was expended during the year.

A total of $86,895.70 had been expended on the existing project up to June 30, 1912. Nothing has been spent for maintenance and nothing received from sales or other sources.

The approved project was completed in 1908. The maximum draft that can be carried June 30, 1912, over the shoalest part of the improved channel is 16 feet at mean lower low water. The length of the improved channel is 6,200 feet in length. The head of navigation is the town of Eureka. The tidal range is 6 feet.

The commerce of this locality is part of the commerce reported in connection with the work of rebuilding the jetties at the entrance to Humboldt Bay, and can not be segregated.

By making commerce for deep-draft vessels possible this project has doubtless tended to reduce freight rates, but there are no statistics available for a comparative analysis.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be used for maintenance.

July 1, 1911, balance unexpended		$13,330.50
June 30, 1912, amount expended during fiscal year, for maintenance of improvements		2,226.20
July 1, 1912, balance unexpended		11,104.30
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 20,000.00

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July 1, 1911, balance unexpended		$335,801.83
Miscellaneous receipts		50.06
		335,851.89
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$164,449.67	
For maintenance of improvement	2,226.20	
		166,675.87
July 1, 1912, balance unexpended		169,176.02
July 1, 1912, outstanding liabilities		16,592.87
July 1, 1912, balance available		152,583.15
Amount appropriated by sundry civil act approved Aug. 24, 1912		250,000.00
Amount available for fiscal year ending June 30, 1913		402,583.15
July 1, 1912, amount covered by uncompleted contracts		686,378.71
Amount of continuing contract authorization, act of Feb. 27, 1911		717,400.00
Amount appropriated under such authorization		250,000.00
Amount yet to be appropriated		467,400.00
Amount (estimated) required to be appropriated for completion of existing project		[2] 467,400.00
Amount that can be profitably expended in fiscal year ending June 30, 1914:		
For works of improvement		[2] 300,000.00
For maintenance of improvement		[2] 20,000.00
Total		[2] 320,000.00

(See Appendix R R 8.)

9. *Removing sunken vessels or craft obstructing or endangering navigation.*—During the month of July, 1911, the wreck of the bark *Agate* was removed from the Government channel in Oakland Harbor, Cal., at a cost of $200. On March 14, 1912, this wreck was sold for $116, and the money deposited in the United States Treasury according to law.

(See Appendix R R 9.)

EXAMINATION MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Report dated July 8, 1911, on preliminary examination of *Crescent City Harbor, Cal.*, required by the river and harbor act approved February 27, 1911, was duly submitted by the district officer. It was reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and was transmitted to Congress and printed in House Document No. 720, Sixty-second Congress, second session. The improvement of this locality by the United States, at least before an investigation of other sites in the vicinity, is not deemed advisable at the present time.

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[1] Exclusive of the balance unexpended July 1, 1912.
[2] Exclusive of amount available for fiscal year 1913.

The local officer was also charged with the duty of making a preliminary examination and survey, required by the river and harbor act approved February 27, 1911, of *Richmond Harbor, Cal.*, and reports thereon will be duly submitted when received.

IMPROVEMENT OF RIVERS AND HARBORS IN THE THIRD SAN FRANCISCO, CAL., DISTRICT.

This district was in the charge of Maj. S. A. Cheney, Corps of Engineers, excepting the improvement of the Sacramento and Feather Rivers, which is in the general charge of a board of three Engineer officers appointed in accordance with the provisions of an act of Congress of June 3, 1896, Maj. Cheney having immediate charge of the work. Division engineer, Col. John Biddle, Corps of Engineers, to July 19, 1911, and Lieut. Col. Thomas H. Rees, Corps of Engineers, since that date.

1. Sacramento and Feather Rivers, Cal.—The Sacramento River has its source in the Sierras in northern California, and flows south through the Sacramento Valley until it joins the San Joaquin River near the head of Suisun Bay. The total length of the Sacramento is approximately 350 miles, about 90 miles of which, above Red Bluff, is more or less torrential and not navigable. The Sacramento River, Suisun Bay, San Pablo Bay, and San Francisco Bay form an inland water transportation system during 6 or 7 months of each year between Red Bluff and San Francisco, Oakland, and the other commercial centers on the three above-named bays and their tributaries, and during the entire year between Chico Landing and the bay points. The distance by this water route between Red Bluff and the city of San Francisco is 310 miles, and between Chico Landing and San Francisco 254 miles.

By their connection the Sacramento and San Joaquin Rivers also form an all-year-round water transportation system between points on the former and points on the San Joaquin and Mokelumne Rivers and the various branches and sloughs tributary thereto.

By their connection with San Francisco Bay the commerce of this network of inland waterways is afforded an outlet to the Pacific Ocean at San Francisco.

The Feather River has its source in the Sierras, flows westerly until it enters the Sacramento Valley in the vicinity of Oroville, then flows south through that valley and empties into Sacramento River at Verona, 20 miles above the city of Sacramento. Above Oroville the Feather River is a mountain stream. It was navigated by steamboats in earlier years up to Marysville, 30 miles above Verona. It is now visited by steamboats only occasionally.

The first appropriation by Congress was "for the improvement of the Sacramento and Feather Rivers, Cal." This appropriation was made March 3, 1875. At that time, due largely to the consequence of hydraulic mining, the depth on some of the bars in the Sacramento River in the 61 miles between its mouth, at Collinsville, and the city of Sacramento was but 4 feet, as compared with the depth of 7 feet which had previously existed. From Sacramento to Colusa, 90 miles, the stream was in favorable condition for navigation by boats drawing about 3 feet of water, but in the 107 miles from Colusa up to Red Bluff navigation was, as it is yet, difficult at numerous places on account of its changing and crooked channels, easily eroded banks, bars, and rapids. Many snags are also brought into this portion of the stream annually by high water. The bed of the Feather River had also been so filled up with débris from the hydraulic mines draining into it and its tributaries that navigation between its mouth in the Sacramento and the head of navigation, at Marysville, was practicable during the higher stages only, usually extending from December to June. The same is true at the present time.

The amount expended prior to operations under the existing project was $740,860.21.

The present project for improvement (reports of Board of Engineers printed in the Annual Reports of the Chief of Engineers for 1898, pp. 2944–2945, and for 1899, pp. 3171–3181) as adopted by the act of Congress approved March 3, 1899, and by subsequent acts, provides for obtaining and maintaining the following-named channel depths in the Sacramento River by continuing the work of removing snags and other obstructions and by the construction of wing dams to concentrate the flow at shoal places, at an estimated first cost of $280,000 and an annual expense of $25,000.

From—	To—	Miles.	Least channel depth to be obtained and maintained.
			Feet.
Mouth of river at Collinsville	Sacramento	61	7
Sacramento	Colusa	90	4
Colusa	Red Bluff	107	3
Total		258	

At the time the reports of the Board of Engineers above referred to were submitted the permanent improvement of the Feather River was not contemplated until the flow of sand and other mining detritus from the Yuba, Bear, and other tributaries should be stopped or the commercial interests involved became greater. Several appropriations have since been made, however, for the improvement of both the Sacramento and Feather Rivers.

The amount expended on the work of the existing project up to the close of the fiscal year ending June 30, 1912, was $287,694.27. Of this amount $37,212.71 was for original work and $250,481.56 for maintenance. The sum of $1,942.07 has been derived from sales of old property.

The expenditures have resulted in obtaining and maintaining all the year round the projected channel depths in the 202 miles of the Sacramento River from its mouth to Chico Landing, and the projected channel depth in the 56 miles from Chico Landing to Red Bluff during about seven months of each year.

The expenditures during the fiscal year ending June 30, 1912, were for maintenance of the channel between the mouth of the river and Chico Landing by removing snags, cutting overhanging trees, dredging several shoals, and constructing wing dams to concentrate the flow on bars.

The river and harbor act approved July 25, 1912, modified the project for Sacramento River above Sacramento in accordance with report printed in House Document No. 76, Sixty-second Congress, second session, so as to provide for securing and maintaining the following-named depths: Four feet from Sacramento to Colusa, 3 feet from Colusa to Chico Landing, and such depth as is practicable from Chico Landing to Red Bluff, at an annual cost of $25,000.

The following statement shows the present conditions for purposes of navigation of the Sacramento and Feather Rivers:

	Sacramento River.	Feather River.
Maximum draft that can be carried at low water.	San Francisco to Sacramento, 7 feet; Sacramento to Colusa, 4 to 5 feet; Colusa to Chico Landing, 3 feet; Chico Landing to Red Bluff, 2½ feet.	Mouth of river to Marysville, 1 to 2 feet.
Head of navigation	Red Bluff	Marysville.
Length, in miles, of navigable portions.	Mouth to Sacramento, 61 miles; mouth to Colusa, 151 miles; mouth to Chico Landing, 202 miles; mouth to Red Bluff, 258 miles.	Mouth to Marysville, 30 miles.

The extreme variation of level of water surface at Red Bluff is about 22 feet, at Collinsville about 8 feet. Tidal influence extends up the Sacramento River to about the city of Sacramento.

The Sacramento River is important as the means for transporting both freight and passengers, steamboats plying regularly all the year round between San Francisco and Chico Landing and during about seven months of each year (December to June) between San Francisco and Red Bluff. The freight carried on the Sacramento River by the five principal transportation companies during the year ending December 31, 1911, was 505,285 short tons, consisting principally of general merchandise, lumber, brick, grain, vegetables, and fruit. The value of the commerce carried was approximately $32,000,000. The number of passengers carried during the same period was 185,396. Extensive areas of the land along the Sacramento River are under a high state of cultivation. Much of the territory along the river is dependent upon the stream as a means of transportation for passengers and freight. The maintenance of the projected channels is important as much of the freight is of a perishable character and can not be subjected to delay when ready for market. In some instances the lower rates of the steamboat lines are met by railroads between the points where the two meet in competition. The traffic on the Sacramento is handled by approximately 50 steamboats, 75 gasoline boats and launches, 45 barges, and, in the lower portions of the stream, by a number of gasoline and sail schooners. Several new modern steamboats have been added to the Sacramento River trade during the past few years.

The existing project, as adopted by Congress, contemplates that the sum of $25,000 will be provided annually for maintenance of the navigable channels. Since this project was adopted, 13 years ago, the funds provided for maintenance have averaged somewhat less than $25,000 per annum, and it has been impracticable properly to maintain the extensive wing-dam system built in 1899–1903. Consequently the channel where it has been controlled in former years by the wing-dam system has, in recent years, shown signs of deterioration, which has made it necessary from time to time to resort to the more expensive method of dredging.

The wing-dam system aggregates approximately 8,800 linear feet in length. Due to natural decay and deterioration of the adjacent wing dams, the river channel at and below Sacramento has become so impaired that navigation was seriously interfered with in the summer months of 1909, 1910, and 1911. This is expected to occur each low-water season until the wing-dam system is restored to its former effectiveness.

It is essential that the old wing dams at the more critical points be restored to their former state of effectiveness during the fiscal year 1914, and a portion of the $40,000 referred to in the appended money statement as the amount required for expenditure during that year will be devoted to that work if the funds are provided. The remainder is necessary to remove snags and similar obstructions which are brought into the channel by the storms each winter.

All this is work of maintenance and is necessary to keep the improvement available.

Much of the country along a considerable portion of the Sacramento, Feather, and San Joaquin Rivers and their tributaries is subject to widespread overflow during the winter and spring months each year, the channels being unable to carry off the rainfall in the valleys and foothills and the melting snow in the mountains. Unrestricted hydraulic mining in earlier years has contributed largely to the difficulty by filling up the beds of the streams.

The interests of navigation, the problem of flood control, and the control and disposition of mine débris in and along the Sacramento and Feather Rivers and their tributaries, including also the San Joaquin River and its tributaries, are all inseparably connected. These matters are in charge of the California Débris Commission. More extended information concerning these subjects may be found in the documents and reports referred to in the summary of the report of the California Débris Commission for the current fiscal year.

SACRAMENTO AND FEATHER RIVERS.

July 1, 1911, balance unexpended	$29,386.05
Received from sales	55.58
	29,441.63
existing project	[1] Indeterminate.
of improvement	29,054.04
July 1, 1912, balance unexpended	387.59
July 1, 1912, outstanding liabilities	387.59
Amount appropriated by river and harbor act approved July 25, 1912	65,000.00
Amount available for fiscal year ending June 30, 1913	65,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] Indeterminate.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 40,000.00

(See Appendix S S 1.)

2. *San Joaquin River, Cal.*—This stream rises in the Sierra and flows first down the western slope thereof, in a southwesterly direction until it reaches the trough of the San Joaquin Valley near Mendota, where it turns and flows northwesterly to Suisun Bay. The stream has a total length of approximately 350 miles. Tidal influence extends up to a point a short distance above San Joaquin Bridge, about 65 miles above the mouth. Up to San Joaquin Bridge the stream is navigated all the year round by boats drawing 2½ feet of water.

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[1] Exclusive of amount available for fiscal year 1913.

From 1884 to 1896 light-draft steamboats operated during the high and mean stages of each year, ranging from 3 to 10 months, as far up as Hills Ferry, a distance of about 140 miles above the mouth. Since 1896 boats have occasionally gone, during times of high water, as far as Firebaughs, about 200 miles above the mouth. In June, 1911, a steamboat ascended as far as Skaggs Bridge, 10 miles below Herndon, which latter place is approximately 265 miles above the mouth.

Throughout its course in the San Joaquin Valley above Hills Ferry so much water is withdrawn for irrigation that that portion of the river during the low-water season, generally extending from August to February, is reduced to a series of pools separated by bars over which there is little or no flow. While San Joaquin Bridge is the actual head of practicable all year round navigation, the city of Stockton, at the head of Stockton Channel, about 50 miles above the mouth of the San Joaquin River, is the principal head of navigation, by reason of the fact that that city is the principal commercial center and distributing point of the region. Boats drawing 6 to 6½ feet ply between San Francisco and Stockton all the year round. The extreme range of tide at Stockton is 3½ feet.

The San Joaquin River below San Joaquin Bridge and its various branches, sloughs, and tributaries, and Sacramento River, which joins the San Joaquin near its mouth, Suisun Bay, San Pablo Bay, and San Francisco Bay all go to form a large and important inland water transportation system.

Before improvement the main channel of San Joaquin River and Stockton Channel below Stockton were crooked and difficult to navigate, with a depth of 6 feet and less at low tide. Above Stockton the San Joaquin was obstructed by snags and numerous bars.

The act of Congress approved June 23, 1874, called for an examination and survey of San Joaquin River, below Stockton, Cal. The report of the survey (printed in the Annual Report of the Chief of Engineers for 1875, part 2, pp. 726–730) contemplated obtaining a low-water channel 7 feet deep below Stockton. Following this the act of Congress approved August 14, 1876, made an appropriation for the improvement of San Joaquin River, Cal. Provision for the improvement of Mormon Channel, which enters Stockton Channel 1 mile below the head of the latter and which forms a part of the commercial front of the city of Stockton, was made by the act of Congress approved March 3, 1881.

In 1880 a reconnaissance was made of the upper San Joaquin River below Hills Ferry, and in 1881 the first work of improvement was done in this portion of the stream.

The project as it exists at this time is as follows:

San Joaquin River and Stockton Channel from Suisun Bay to the city of Stockton.—The project printed (with maps) in House Document No. 1124, Sixtieth Congress, second session, as adopted by the act of Congress approved June 25, 1910, provides for obtaining a channel having a 200-foot bottom width and 9-foot depth, at an estimated first cost of $240,000 and $25,000 annually for maintenance, to be accomplished by dredging and making two cut-offs.

Mormon Channel.—The existing project is the one adopted by act of March 3, 1881, and provides for maintaining a low-water channel 80 feet wide and 4 feet deep from Stockton Channel to

Miller's Warehouse, at Center Street, in the city of Stockton, a distance of 1¾ miles.

Fremont Channel and McLeod Lake.—The improvement of these branches of the San Joaquin River with a view to affording additional harbor facilities in the city of Stockton was authorized by the river and harbor act of July 25, 1912, in accordance with report printed in House Document No. 581, Sixty-second Congress, second session (with map), which contemplates dredging Fremont Channel and McLeod Lake to a depth of 9 feet at mean low water, at an estimated first-cost of $11,000 and $500 annually for maintenance after completion.

San Joaquin River above Stockton.—The project (of 1881) is necessarily indefinite. A channel 3 feet deep all the year round in the 20 miles between the mouth of Stockton Channel and San Joaquin Bridge meets fairly the present needs of navigation, and the operations have been conducted with the view of maintaining such a channel. From San Joaquin Bridge up to Hills Ferry navigation is limited to occasional trips by light-draft steamboats during the high and mean stages of each year, and operations have consisted of aiding such navigation by removing the worst obstructions and concentrating the flow in the main channel by means of wing dams, and closing side channels.

The interests of navigation, the control of floods, and the control and disposition of mine débris in and along the San Joaquin and Sacramento Rivers and their tributaries are in charge of the California Débris Commission. More extended information on these subjects may be found in the various publications referred to in the summary of the annual report of the California Débris Commission for the fiscal year ending June 30, 1912.

The total amount expended prior to the project adopted by the act of June 25, 1910, was $572,977.64.

The amount expended since the adoption of the project by the act of June 25, 1910, up to June 30, 1912, was $41,412.96 for maintenance.

This work of maintenance has consisted of dredging shoals in Stockton and Mormon Channels to keep those channels open for navigation.

The operations during the fiscal year ending June 30, 1912, consisted of maintaining the projected channel in Mormon Channel. This involved the dredging of approximately 267,000 cubic yards of material from that channel.

Operations under the project adopted by the act of June 25, 1910, are being held in abeyance until the land needed in executing the project is transferred to the United States free of cost, as required by the act of June 25, 1910. It is expected that this will be done during the coming year.

The maximum drafts that may be carried at low water at the present time are as follows:

San Joaquin River.	Stockton Channel.	Mormon Channel.
Mouth to Stockton Channel, 6½ feet; Stockton Channel to San Joaquin Bridge, 2½ feet; San Joaquin Bridge to Hills Ferry, a few inches.	Mouth to Stockton, 6½ feet.	Mouth to Miller's Warehouse, 4 feet.

The commerce carried on the San Joaquin River above San Joaquin Bridge is very limited. Below that point, and especially below Stockton, the several branches of the river as well as the numerous sloughs and dredged cuts afford facilities for transporting the commerce of a large area of country under a high state of development, much of which country is entirely dependent upon water transportation for freight and passengers. Approximately 15 steamboats, 150 gasoline tugboats and launches, 40 barges, and 50 gasoline and sail schooners are engaged in this trade.

Freight rates by both water and rail are low, the railroads generally meeting the low rates by water.

Approximately 660,000 short tons of freight, valued at $33,000,000, is handled annually on the river.

The amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, for works of improvement, is the balance remaining to be appropriated by Congress to complete the project for a 9-foot channel from Suisun Bay to Stockton adopted by the act of June 25, 1910. To complete this project with due economy, and within the estimated cost, the $159,632.70 needed for completion should be provided at one time.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, for maintenance of improvement, is the amount it is estimated will be required to maintain the existing navigable channels in San Joaquin River, Stockton Channel, Mormon Channel, Fremont Channel, and McLeod Lake, by dredging material which may be brought into the channels by high water, and for maintenance of completed works for the rectification of Stockton and Mormon Channels. The maintenance of these channels at all times is important as a large area of country is dependent upon them for transportation. Much of the freight is of a perishable character, and can not be subjected to delay when ready for market.

July 1, 1911, balance unexpended	$80,367.30
Received by Treasury Department settlement	11.25
	80,378.55
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	20,087.90
July 1, 1912, balance unexpended	60,290.65
July 1, 1912, outstanding liabilities	1,128.07
July 1, 1912, balance available	59,162.58
Amount appropriated by river and harbor act approved July 25, 1912	[1] 51,000.00
Amount available for fiscal year ending June 30, 1913	[1] 110,162.58
Amount (estimated) required to be appropriated for completion of existing project	[2] 159,632.00
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	[2] 159,632.00
For maintenance of improvement	[2] [3] 26,500.00
Total	[2] [3] 186,132.00

(See Appendix S S 2.)

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[1] Includes $11,000 for Fremont Channel and McLeod Lake branches of San Joaquin River in the city of Stockton.

[2] Exclusive of amount available for fiscal year 1913.

[3] Including maintenance of Fremont Channel and McLeod Lake and of completed works for rectification of Stockton and Mormon Channels.

3. Stockton and Mormon Channels, Cal.—Stockton Channel extends from the San Joaquin River up to the city of Stockton, a distance of approximately 3 miles. It is the principal commercial front of the city of Stockton and it affords the only means of transportation by water to and from Stockton for a large and valuable commerce.

Mormon Channel or Slough enters Stockton Channel about 1 mile below the head of the later at Stockton. Mormon Channel is navigable in the lower 1¾ miles and throughout this distance it forms a part of the commercial front of the city of Stockton.

Calaveras River rises in the Sierras, flows westward passing north of Stockton and empties into San Joaquin River about 5 miles below Stockton. The banks of the Calaveras River where it flows through the foothills are easily eroded and there are numerous sharp bends. These conditions result in much cutting of banks during floods along the Calaveras River in the foothills, and considerable land is washed away and carried downstream. A large amount of this material is discharged by the Calaveras River into Mormon Channel near Bellota, and was formerly deposited in the navigable portions of Mormon Channel and in Stockton Channel, to the detriment of navigation. Much dredging was necessary to keep the navigable portions of the channels free of the material.

The act of June 13, 1902, adopted a project designed to prevent the material discharged into Mormon Channel by Calaveras River from reaching the lower portion of Mormon Channel and Stockton Channel, this to be accomplished by diverting the flow of Mormon Channel by means of a dam across that channel several miles east of Stockton, a canal about 5 miles long extending from this dam to the Calaveras River at a point 3 miles north of Stockton, and increasing the capacity of the channel of Calaveras River, thence to the San Joaquin River. The project was printed, with maps, in House Document No. 152, Fifty-fifth Congress, third session, and, without maps, in the annual report of the Chief of Engineers for 1899, pages 3188–3193. The estimated cost of the project was $224,316, exclusive of the cost of the necessary rights of way, which latter, under the terms of the act of June 13, 1902, were to be furnished the United States free of cost.

On account of the increase in the cost of doing work, which took place between the time the first estimate was made, in 1898, and the time the necessary rights of way were turned over to the United States, in 1907, an increase in the estimate of cost, amounting to $56,079, became necessary.

The total amount expended on the project up to June 30, 1912, was $244,487.75. Of this amount, $3,473.89 was for maintenance. These expenditures resulted in the construction of the projected dam across Mormon Channel, the completion of the canal thence to the Calaveras River, the partial enlargement of the capacity of the channel of Calaveras River below the lower end of the canal, and in making the necessary changes in a number of wagon and railroad bridges and their approaches.

The works have accomplished the desired result in part. They will be more effective, however, when the south bank of Mormon Channel above the dam is protected by levees and the work of increasing the capacity of the channel of Calaveras River below the canal is carried further. The State of California proposes to construct the levee needed on the south bank of Mormon Channel above the dam, and the work of further increasing the capacity of the channel of Calaveras River below the canal will be undertaken by the United States, so far as the funds available will permit, during the forthcoming year.

The operations during the fiscal year ending June 30, 1912, consisted principally of making investigations and borings to determine the greatest increase that may be obtained in the flood-carrying capacity of the works with the funds available and preparing specifications therefor preparatory to advertising for proposals for doing the work.

The amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, is needed to maintain the existing works in serviceable condition. The work of maintenance will consist principally of keeping the canal free of undergrowth and closing any breaks which may occur in the dam or in the embankments of the canal.

July 1, 1911, balance unexpended	$38,082.60
Received in Treasury Department settlement	8.33
	38,090.93
June 30, 1912, amount expended during fiscal year, for works of improvement	2,175.35
July 1, 1912, balance unexpended	35,915.58
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	([1])

(See Appendix S S 3.)

4. *Mokelumne River, Cal.*—This stream rises in the Sierras in eastern California, flows westward across central California and empties into the San Joaquin River 20 miles above the junction of the Sacramento and San Joaquin Rivers at the upper end of Suisun Bay. In its upper portions the Mokelumne is a mountain stream, more or less torrential. In the lower part of its course it enters the delta of the San Joaquin and Sacramento Rivers, connects with other navigable sloughs, and is subject to tidal influence. This circumstance makes the lower portions of the stream navigable. Tidal influence extends up to a point about 2 miles above the Galt-New Hope Bridge.

In 1881 an estimate, amounting to $8,250, was submitted for removing snags, overhanging trees, etc., (report printed in the Annual Report of the Chief of Engineers for 1882, pt. 3, pp. 2637–2640). The first appropriation for improvement, $8,500 in amount, was made by the act of Congress of July 5, 1884. Since that time small appropriations have been made from time to time, and they have been applied toward obtaining and maintaining low-water steamboat channels by removing snags, overhanging trees, and occasional dredging.

The following low-water depths are now maintained:

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[1] Included in the $26,500 recommended for maintenance of San Joaquin River, etc. See p. 1172.

	Depth (feet).	Miles (approximate).
Mouth of river to lower junction of North and South Forks	9	4
Lower junction of the North and South Forks to Snodgrass Slough by way of North Fork	9	8
Snodgrass Slough to upper junction of North and South Forks at New Hope Landing	6	1
Lower junction of the North and South Forks to upper junction of those forks at New Hope Landing, by way of South Fork	9	14
New Hope Landing to Galt-New Hope Bridge	8	8

The course of the Mokelumne River throughout is shown on map at page 2492 of the Annual Report of the Chief of Engineers for 1881 (part 3). Its lower (navigable) portions are shown on map No. 7 (sheet E) printed with House Document No. 81, Sixty-second Congress, first session.

The interests of navigation, the control of floods, and the control and disposition of mine débris in and along the Sacramento and San Joaquin Rivers and their tributaries are in charge of the California Débris Commission. More extended information on these subjects may be found in the various publications referred to in the summary of the annual report of the California Débris Commission for the fiscal year ending June 30, 1912.

The low lying country along the lower portions of the stream are under a high state of cultivation, being protected from overflow by levees built and maintained by the property owners.

The operations during the fiscal year ending June 30, 1912, were for maintenance, and consisted of removing a hard-pan reef which extended across the channel at Whitakers Slough, dredging a number of bars, and removing obstructing snags and overhanging trees in the 8 miles of the river between New Hope Landing and the Galt-New Hope Bridge.

The total amount expended on the project up to the close of the fiscal year ending June 30, 1912, was $28,959.65, principally for maintenance.

Approximately 35,000 short tons of freight is carried on the stream annually, valued at $2,500,000. The river is crossed by three railroads a few miles above the head of navigation, and the maintenance of navigation on the stream has a decidedly beneficial influence upon the freight rates by rail.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, is needed to maintain the existing steamboat channel depths in both forks of the river from its mouth up to the Galt-New Hope Bridge, by dredging occasional shoals, removing snags and overhanging trees.

July 1, 1911, balance unexpended	$7,002.63
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	5,962.28
July 1, 1912, balance unexpended	1,040.35
July 1, 1912, outstanding liabilities	745.00
July 1, 1912, balance available	295.35

Amount (estimated) required to be appropriated for completion of existing project .... Indeterminate.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement .... [1] $1,000.00

(See Appendix S S 4.)

EXAMINATION, WITH PLAN AND ESTIMATE OF COST OF IMPROVEMENT, MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Reports dated May 20, 1911, and October 6, 1911, with map, on preliminary examination, with plan and estimate of cost of improvement, of *Fremont Channel and McLeod Lake, arms of Stockton Channel, San Joaquin River, Cal.*, required by the river and harbor act approved February 27, 1911, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 581, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $11,000, subject to the conditions specified in the report, is presented.

The local officer was also charged with the duty of making other preliminary examinations and surveys required by the river and harbor act of February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. *San Joaquin River, Cal.*, with a view to its improvement up to a point at or near Herndon by means of locks and dams or otherwise.
2. *Mokelumne River, Cal.*, with a view to its improvement from the Galt-New Hope Bridge to a point at or near Woodbridge.

IMPROVEMENT OF RIVERS AND HARBORS IN THE FIRST PORTLAND, OREG., DISTRICT.

This district was in the charge of Maj. Jay J. Morrow, Corps of Engineers, having under his immediate orders Capt. Henry H. Robert, Corps of Engineers. Division engineers, Col. John Biddle, Corps of Engineers, to July 20, 1911, and Lieut. Col. Thomas H. Rees, Corps of Engineers, since that date.

1. *Coquille River, Oreg.*—The Coquille River rises in the Coast Range, flows about 100 miles in a northwesterly direction, and empties into the Pacific Ocean at Bandon, Oreg., about 375 miles north of San Francisco. Before improvement the channel at the mouth skirted the south headland for some distance, as shown on map opposite page 2682 of the Annual Report of the Chief of Engineers for 1882, and was shoal, shifting, and studded with dangerous rocks. The depth over the bar was usually about 3 feet at low tide and was available only for small coasting vessels.

The original project for improvement was adopted in 1878, and provided for the construction of two converging, high-tide jetties, built of rubblestone, 800 feet apart, so located as to cause the river to empty into the sea about one-half mile north of the original mouth of the river, these jetties to run out to sea a sufficient distance to create and maintain a channel 12 feet deep at low tide. In 1880 the proposed depth of 12 feet at low tide was reduced to 10 feet; in 1888 it was reduced to 8 feet, and under date of May 8, 1891, the plan was changed to provide that the jetties should be 600 feet apart at their outer ends instead of 800 feet.

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[1] Exclusive of the balance unexpended July 1, 1912.

The above changes, and the limitation of the length of the south jetty to 2,700 feet, and of the north jetty to 1,575 feet, by the act of July 13, 1892, constitute the previous project.

The amount expended on the original and modified project to the close of the fiscal year ending June 30, 1912, was $351,192.75, of which $48,351.07 was applied to maintenance.

The present project, adopted by the river and harbor act of June 25, 1910, is in accordance with plan printed in House Document No. 673, Sixty-first Congress, second session, and provides for the removal of snags between the mouth of the North Fork and Bandon, the removal of a mid-channel rock at Rocky Point, and the rocks near the mouth of the river, dredging a low-water channel 140 feet in width through the Bandon shoal, and 100 feet in width through other shoals up to Coquille, the channel to be 9 feet in depth between Coquille and Riverton, and 10 feet in depth between Riverton and the mouth, and the constructing of some regulating works, at an estimated cost of $50,000, with $6,000 annually for maintenance, all of which was appropriated by the act. No modification in the existing project has been made.

The Government snag scow, transferred from Coos River, and engaged in snagging operations on the Coquille River at the end of last fiscal year, finished that work about August 31, 1911, 606 snags having been removed during the fiscal year, piled up and burned, and channel left clear of snags between Bandon and mouth of North Fork, a distance of about 36 miles.

The dredge *Oregon* having been towed from Coos Bay, and in operation at the close of last fiscal year, continued operations until September 8, 1911, completing the projected channel through the Bandon, Randolph, Parkersburg, and Walstrom Landing shoals, and was then returned to Coos Bay; 101,516 cubic yards of material being removed during the fiscal year and pumped behind bulkheads previously provided.

To permit the dredge *Oregon* to be returned to Coos Bay during favorable weather conditions, a bucket dredge was hired to cut through Strangs shoal, which required about 42 days, and was completed October 6, 1911.

The combined snag and drill scow, in operation at the end of last fiscal year, continued subaqueous rock work during the present fiscal year, removing rocks "C," "D," "E," the rocks at Rocky Point, and several smaller rocks near Bandon, to a depth of 10 feet below mean lower low tide. About 1,200 cubic yards of rock were dredged from the blasted rocks and placed along the shore.

No work was done in maintaining the jetties at the entrance completed in 1908. The jetties have remained in fairly good condition, although their outer ends were beaten down slightly by the heavy seas. The depth in the bar channel has been well maintained, and not less than 8 feet at low tide was reported.

The amount expended on the existing project to June 30, 1912, is $54,148.15.

The Coquille River, from the entrance to Coquille, a distance of 25 miles, had a controlling depth at mean lower low tide of about 5 feet on several bars, with channel width varying from 50 to 500 feet, and was more or less obstructed by snags and submerged rocks near Bandon, but could be navigated for that distance by such vessels as could cross the bar. Between Coquille city and Myrtle Point, 12 miles above, the river was navigable for small light-draft steamboats at high tide in a channel with a controlling depth at low tide of not more than 1 foot. This part of the channel was much obstructed by snags, and in places less than 50 feet in width.

The tide rises about 4.2 feet at Bandon, near the mouth. Logging is carried on extensively on the headwaters for distances of 30, 26, and 18 miles above Myrtle Point on the North, South, and Middle Forks, respectively.

The freight is loaded on small coasting vessels along the 25 miles between Bandon and Coquille city and is usually taken to San Francisco. The total imports and exports during the calendar year amounted to 130,781 short tons, valued at $2,724,269. The exports consist principally of lumber, live stock, and farm products, and the imports of general merchandise, machinery, etc.

The improvement will increase the carrying capacity of vessels and have the effect of reducing freight rates on all shipments, as the ocean is the only available means of transporting the products to market.

No additional work is necessary to make the channel available.

The present project is expected to be completed about July 10, 1912, about 98 per cent of it now having been accomplished, which will insure a navigable channel of the depths and widths called for in the existing project to Coquille City.

From soundings taken in June, 1912, a shoaling of from 1 to 2 feet was discovered on the Bandon Shoal, which had occurred since last September, when the project work at this point was finished. This will require a small amount of maintenance work, which will be undertaken immediately after the work on existing project is completed in July of the next fiscal year.

The amount estimated as necessary for one year's maintenance, $6,000, will be required to maintain the project depths to Coquille City, as it is believed that all of the cuts have shoaled more or less since completion.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth [1]	Senate	120	Forty-third	First		
Do.[1]					1879	1556
Do.[1]					1881	[illegible]
Coquille City to Myrtle Point [1]					1887	2408
Do.[2]					1896	3351
Do.[2]	House	899	Sixtieth	First		
Mouth to Myrtle Point [1]	do	673	Sixty-first	Second		

[1] No maps.

[2] Contains maps.

Comparative statement of traffic.

Calendar years.	Short tons.	Estimated value.	Calendar years.	Short tons.	Estimated value
1902	37,458		1907	60,504	$1,867,634
1903	48,249		1908	68,426	1,875,938
1904	60,944	$1,322,058	1909	85,127	2,110,898
1905	45,455	1,105,750	1910	208,586	3,129,982
1906	67,288	1,119,716	1911	130,781	2,724,269

July 1, 1911, balance unexpended	$44, 310. 18
Received account sale of blue prints	10. 45
	44, 320. 63
June 30, 1912, amount expended during fiscal year, for works of improvement	38. 651. 08
July 1, 1912, balance unexpended	5, 669. 55
July 1, 1912, outstanding liabilities	1, 800. 00
July 1, 1912, balance available	3, 869. 55
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 6, 000. 00

(See Appendix T T 1.)

2. *Entrance to Coos Bay and Harbor, Oreg.*—Coos Bay is a tidal estuary on the Pacific coast, in Oregon, about 180 miles south of the Columbia River. Next to Humboldt Harbor, in California, it is the principal harbor between the mouth of the Columbia River and San Francisco. Its tidal area is about 15 square miles, which includes about 900 acres of anchorage area of not less than 18 feet at mean lower low tide.

In its original condition the bay ship channel to Marshfield was obstructed by several shoals, the controlling depth on Pony Slough Shoal being about 12 feet at mean lower low tide, and on the Hogsback Shoal, near Marshfield, about 8 feet at the same stage.

Before improvement the entrance channel skirted the south headland and crossed the bar in a northwesterly direction, with a controlling depth of about 3 feet at mean lower low tide, as shown on map opposite page 2682 of the Annual Report of the Chief of Engineers for 1882, and was shoal and shifting and studded with dangerous rocks.

The bar channel did not exceed 100 feet in width and was available only for small coasting vessels drawing not to exceed 8 feet.

The original project was approved by the Secretary of War November 24, 1879, and provided for the construction of a jetty from a point about 250 yards below Fossil Point on a line toward the east end of Coos Head, the structure to be of wood and stone, or stone, as should be found best. A total of $213,750 was expended on this project, and 1,760 feet of jetty were constructed.

The project for increasing the depth across the bar to 20 feet was adopted by act of Congress approved September 19, 1890. The estimated cost was $2,466,412, and provided for the construction of a north jetty 9,600 feet long and a slightly converging south jetty 4,200 feet long.

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[1] Exclusive of the balance unexpended July 1, 1912.

The expenditures on this project amounted to $721,720.76, of which $196,721.32 was for maintenance. In addition to this, upward of $82,000 has been expended on the inner harbor for a low-water depth of 12 feet to the town of Marshfield. The amount derived from sales, etc., is $461.08.

The present project, adopted by the river and harbor act of June 25, 1910, is in accordance with plan printed in House Document No. 958, Sixtieth Congress, first session, and provides for constructing and operating a seagoing hydraulic dredge for deepening the channel over the bar and for dredging the channels within the bay, with a view to securing a depth of 18 feet up to the town of Marshfield. The estimated cost was $500,000 and cost of maintenance $60,000 annually. The above-mentioned act appropriated $350,000 for constructing the dredge and $50,000 to be applied to dredging in the inner bay.

The amount expended on the existing project to the end of the fiscal year ending June 30, 1912, was $73,449.81.

No work was done in connection with previous projects during the year, they having been completed in former years. Dredge *Oregon*, constructed in 1908 with funds appropriated by act of March 2, 1907, for use on various harbors on the coasts of Oregon and Washington, was towed from Coquille River on September 14, 1911, to complete the dredging in the inner bay, on the approved project for an 18-foot channel from the bar to Marshfield, funds for which were appropriated by act of June 25, 1910, and operations were continued thereon during the balance of the fiscal year. Six hundred and thirty-two thousand three hundred and twenty-four cubic yards of material was excavated and pumped behind bulkheads erected by private parties, 266,331 cubic yards of which was paid for by local interests in widening the projected channel to 300 feet between Marshfield and North Bend.

The dredging on this project to the present time has increased the depths over many of the shoals from a controlling depth of about 12 feet to one of at least 17 feet at low water. It is estimated that the dredging in inside channels covered by the project is about 90 per cent completed.

Plans were completed for the seagoing dredge for service on the bar, and contract for construction entered into with the Seattle Construction & Drydock Co., Seattle, Wash., under date of April 19, 1912. Actual construction has commenced and the contractors have 14 months in which to complete the contract.

The project depth of 20 feet on the bar was obtained in 1894 when the north jetty had been extended to a length of 9,520 feet. The south jetty has therefore not been built, and the improvement has been made at a fraction of the estimated cost. It has resulted in a permanent channel of from 17 to 22 feet depth at mean low tide, close to and parallel with the north jetty. The variation of the water levels on account of the tide is about 4.8 feet. Ocean-going vessels ascend the bay to the town of Bay City immediately above Marshfield and about 14 miles from the mouth, above which point there is about 50 miles of available navigation for boats of light draft. The logging industry is very extensive, and is carried on throughout the whole year, large quantities of logs being floated from the headwaters to the mills along the bay.

The principal products are coal, lumber, farm and dairy products, live stock, woolen goods, and salmon. The imports consist of farm and mill machinery and miscellaneous merchandise. The total tonnage during the calendar year 1911 amounted to 303,008 short tons, valued at $7,097,617.

The bay and ocean form the only means of transporting products to outside markets, and the improvement has the effect of increasing the carrying capacity of vessels using the channel, with a consequent decrease of freight rates.

The appropriation recommended for the fiscal year 1914 will be applied to maintaining the completed channels in Coos Bay and to equipping and operating the bar dredge authorized by the river and harbor act of June 25, 1910.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Entrance [1]					1879	1791
Do.[1]					1890	2936
Entrance and bay [1]	House	958	Sixtieth	First		
Entrance [1]	do	284	Sixty-second	Second		

[1] No maps.

Comparative statement of traffic.

Calendar years.	Short tons.	Estimated value.	Calendar years.	Short tons.	Estimated value.
1902	122,252		1907	167,562	$6,400,000
1903	135,178		1908	216,631	7,077,140
1904	136,958	$3,557,984	1909	281,008	7,968,610
1905	178,945	3,901,906	1910	242,942	7,377,068
1906	184,455	5,900,017	1911	303,008	7,097,617

July 1, 1911, balance unexpended		$403, 759. 46
Received account sales of blue prints		5. 60
		403, 765. 06
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$31, 474. 55	
For maintenance of improvement	5, 000. 00	
		36, 474. 55
July 1, 1912, balance unexpended		367, 290. 51
July 1, 1912, outstanding liabilities		2, 400. 00
July 1, 1912, balance available		364, 890. 51

Amount (estimated) required to be appropriated for completion of existing project	[1] $60,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 80,000.00

(See Appendix T T 2.)

3. Coos River, Oreg.—Coos River rises in the Coast Range of mountains, about 85 miles north of the south boundary of the State of Oregon, flows about 60 miles in a general westerly direction, and empties into Coos Bay at its head. The navigable portion of the river is about 1,000 feet wide. It is the principal tributary of Coos Bay. At a point 5½ miles from its mouth the river divides into two branches, known as the North and South Forks, up each of which tidal influence extends for about 8½ miles. Before improvement was commenced the small light-draft steamboats and launches plying between Marshfield and the head of tide on each fork experienced considerable difficulty in navigating on account of the many snags, bowlders, etc., in the stream.

The original and existing plan of improvement, based on the survey made in 1894 (Annual Report of the Chief of Engineers for 1895, pp. 3502–3505), proposed the removal of all snags and bowlders from a selected channel, 50 feet in width, in the main river and on both the North and South Forks to the head of navigation. The estimated cost was $5,000, but in 1898 it was stated in the annual report that $3,000 additional would be required to complete the project, and in 1900 it was estimated that an appropriation of $1,500 every two years would be required for maintenance.

The amount expended on the project to June 30, 1912, was $18,232.85, of which $10,232.85 has been applied to maintenance.

Previous to 1910, the last work done on this project was in September, 1907, when the stream was snagged and several of the shoals dredged.

The act of June 25, 1910, appropriated $3,000 for maintenance. The Government snag scow and dredge were put in order in August, 1910, and operated on Coos River, by hired labor, until November 21, 1910, removing all troublesome snags from the head of navigation on both forks to the mouth.

A considerable shoaling had taken place just below Alleghany, on the North Fork, and a bucket dredge, with crew, was employed from July 24 to August 9, 1911, cutting a channel through the shoal 40 feet wide, 700 feet long, and 3 feet in depth at low water. About 8,956 cubic yards of sand and silt were removed.

The project may be considered as completed, and the work done has resulted in a safer and better channel for the small craft plying the stream. The maximum draft that can be carried at low tide over the upper reaches is about 1½ feet. The range of tide is about 2½ feet, so that boats drawing 4 feet navigate to the head of tide water on both the North and South Forks, a distance of about 14 miles above the mouth. Logging from the extensive forests along the upper reaches of this stream is one of the main industries, and the logs are floated down to the booms in the lower reaches of the river and towed to the mills along the bay.

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[1] Exclusive of the balance unexpended July 1, 1912.

The valley is very fertile, and the commerce is mostly farm and dairy products, logs, and lumber. The produce is carried in small steamers to Marshfield, where it is loaded in ocean steamers and taken to the San Francisco and Portland markets. This traffic amounted during the calendar year 1911, including supplies, machinery, etc., received, to 68,434 short tons, valued at $1,940,052.

The maintenance of the improvement is a benefit to navigation and is essential to the economical and safe operation of steamboats.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to head of navigation [1]	House	42	Fifty-second	Second	1893	3437
Do	do	[2] 237	Fifty-third	Third	1895 [1]	3502

[1] No maps. [2] Contains maps.

Comparative statement of traffic.

Calendar years.	Short tons.	Estimated value.	Calendar years.	Short tons.	Estimated value.
1902	46,000		1907	42,078	$1,613,948
1903	28,109		1908	36,697	1,679,161
1904	49,907	$1,068,758	1909	45,908	1,991,849
1905	44,898	1,179,974	1910	40,150	1,528,343
1906	35,587	1,246,684	1911	68,434	1,940,052

July 1, 1911, balance unexpended	$1,445.95
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	678.80
July 1, 1912, balance unexpended	767.15
Amount appropriated by river and harbor act approved July 25, 1912	3,000.00
Amount available for fiscal year ending June 30, 1913	3,767.15

(See Appendix T T 3.)

4. *Mouth of Siuslaw River, Oreg.*—The Siuslaw River rises in the Coast Range of mountains, flows for about 110 miles in a westerly direction, and empties into the Pacific Ocean at a point about 475 miles north of San Francisco, Cal.

The river between the entrance and Florence, throughout a distance of about 4 miles, has a width of from 500 to 1,000 feet, with controlling channel depths of about 8 or 9 feet at mean lower low tide.

It enters the sea through a shifting sand beach. The obstruction at the entrance is a shoal outer bar with deficient depth and shifting channel. The bar channel before improvement changed its position up and down the coast as much as 1 mile. The depth of water on the bar varied from 5 to 12 feet at low tide.

On August 4, 1891, the Secretary of War approved a project for improvement which provided for the construction of two rubblestone high-tide jetties 7,500 feet and 5,600 feet long, respectively, on the north and south sides of the entrance. The estimated cost of the improvement was $700,000. By these jetties it was expected to keep the channel in a fixed position and to increase the depth to 8 feet at low tide in the bar channel.

This project has been only partially carried out. Four thousand and ninety feet of the north jetty has been built, at a cost of $151,700.83 in original construction and $10,611.27 in maintenance, surveys, etc. Nothing was done on the south jetty. The north jetty has had the effect of somewhat checking the tendency of the bar channel to shift its position as far to the north as frequently occurred before the jetty was built, but the expected depth at low tide in the bar channel has not been realized.

Upon the recommendation of the Board of Engineers for Rivers and Harbors, Congress provided in the river and harbor act of March 3, 1905, that the unexpended balance be returned to the Treasury, except an amount sufficient for maintenance for two years.

The plant used during construction was disposed of and the balance remaining to the credit of the appropriation accordingly turned into the general fund of the Treasury and the work abandoned.

By river and harbor act of June 25, 1910, Congress again adopted a project for improvement, which is printed as House Document No. 648, Sixty-first Congress, second session. The plan proposes the construction of two mean high-tide rubblestone jetties, the north jetty to extend from a point near the end of the old jetty westerly, on a curve of 4,000 feet radius, along the edge of the north spit for a distance of about 3,700 feet, the south jetty to extend northwesterly, on a curve of 2,350 feet radius, across the south pit for a distance of about 4,200 feet, the two jetties being 750 feet apart at their extremities. Estimated cost, $426,000, with $5,000 annually during construction for maintenance and repairs.

The act appropriated $50,000 and authorized continuing contracts not exceeding $165,500, and provided that the port of Siuslaw or other local agency shall furnish the sum of $215,500, in funds or accomplished work. The amount authorized is sufficient to complete the project.

Work was started by the port of Siuslaw during the year 1910, and a contract was made by the port for extending the south jetty as far as their available funds, amounting to $100,000, would permit. Preliminary work commenced in February, 1910, and was completed in June, 1911, when 2,940 feet of tramway had been built and about 65,500 tons of rock emplaced, at a cost of $89,509.11. Nearly all of this work was done during the fiscal year ending June 30, 1911.

The sundry civil act approved March 4, 1911, appropriated $50,000 additional to carry on the work under the project in connection with the port of Siuslaw during the fiscal year ending June 30, 1912.

The provisions of the river and harbor act of June 25, 1910, were amended by the river and harbor act of February 27, 1911, to provide that the port of Siuslaw might proceed with the construction of the south jetty in pursuance of the contract with Robert Wakefield, entered into December 24, 1909, to the full extent of said contract; and the amount to be furnished by the port of Siuslaw or other agency to be reduced by such amounts, not exceeding $100,000, as may be expended under the said contract, provided that all the work so done shall be in accord with the adopted project and satisfactory to the Secretary of War.

As soon as the port had raised the required amount by the sale of bonds, and it was made available, advertisement was issued for the completion of the remaining portion of the work under the project by contract, and contract was entered into with Johnson-Anderson Co., Portland, Oreg., under date of December 1, 1911, for construction of a receiving wharf and extending north jetty, for the sum of $200,686. Work was commenced thereon January 10, 1912, to be completed in March, 1915.

A supplemental agreement to the above-mentioned contract, for the enlargement of the receiving wharf, was entered into on May 19, 1912, and the work accomplished in June, 1912, for the sum of $507.28.

A second contract was entered into with the Johnson-Anderson Co., under date of February 2, 1912, for extension of the south jetty a distance seaward of 400 feet and for reenforcement of the enrockment, the price being $43,275.70. Work was commenced thereon April 15, 1912. It is estimated that about 25 per cent of the whole project is completed.

The amount expended on the existing project to the end of the fiscal year ending June 30, 1912, was $22,654.18, all for improvement, not including the amount expended by the port of Siuslaw.

No modification has been made in the existing project.

There has been no marked increase in the bar channel depth. The depths, however, appear to be more stable than formerly. The usual depths found on the bar at high tide range from 11 to 14 feet. The maximum draft that could be carried over the bar at mean low water when last survey was made was about 7 feet. The high-water line on the south spit has advanced northerly along the newly constructed jetty a distance of fully one-fourth of a mile. The average range of tide is about 5.2 feet, and vessels generally cross the bar at the time of high tide. Vessels which enter the bay can ascend 6 miles to a point a short distance above Florence with little difficulty.

The head of navigation for light-draft boats is at the head of tidewater, about 15 miles above Florence.

The commerce of Siuslaw is limited at present, the country being thinly settled and transportation facilities primitive. The river and ocean form the only means of transportation, and any increase in depths and permanency in location in the bar channel would be of great benefit in lessening the cost of marketing the products. There are tributary to the port extensive logging interests, besides salmon canning and dairy products, the sawmills having a combined daily capacity of 150,000 feet of lumber. The mills, however, are not operated constantly, the freight rate to San Francisco being $2 higher than from Coquille River, and $1.15 higher than from Coos Bay, with but a slightly longer haul.

Since active operations have been commenced on jetty construction, and on the projected line of railway from Eugene, Oreg., down the Siuslaw River to the mouth, and thence to Coos Bay, considerable activity is in evidence in the lumber industry, and it is expected that the shipments will soon be considerably increased.

The amount recommended for expenditure is to be applied to work under the approved project.

References to examination and survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Siuslaw Bay.						
Mouth to Acme [1]	House	71	Fifty-first	First	1890	2909
Do.[2]					1891	3173
Do.[1]					1903	2229
Mouth [2]	House	648	Sixty-first	Second		

[1] No maps.

[2] Contains maps.

Comparative statement of traffic.

Calendar year	Short tons.	Estimated value.	Calendar year.	Short tons.	Estimated value.
1902	25,218		1907	Unknown	
1903	25,337		1908		
1904	24,816	$584,146	1909		
1905	13,090	259,165	1910		
1906	14,344	358,890	1911		

July 1, 1911, balance unexpended	$99,946.28
June 30, 1912, amount expended during fiscal year, for works of improvement	22,600.46
July 1, 1912, balance unexpended	77,345.82
July 1, 1912, outstanding liabilities	12,680.00
July 1, 1912, balance available	64,665.82
Amount appropriated by sundry civil act, approved August 24, 1912	35,000.00
Amount appropriated by river and harbor act, approved July 25, 1912	5,000.00
Amount available for fiscal year ending June 30, 1913	104,665.82
July 1, 1912, amount covered by uncompleted contracts	[1] 212,679.05
Amount of continuing contract authorization, act of June 25, 1910	165,500.00
Amount appropriated under such authorization	85,000.00
Amount yet to be appropriated	80,500.00
Amount (estimated) required to be appropriated for completion of existing project	[2] 80,500.00

[1] One-half to be furnished by local interests.

[2] Exclusive of amount available for fiscal year 1913.

Amount that can be profitably expended in fiscal year ending June 30, 1914:

For works of improvement	[1] $80, 500.00
For maintenance of improvement	[1] 5, 000.00
Total	[1] 85, 500.00

(See Appendix T T 4.)

5. Tillamook Bay and bar, Oregon.—Tillamook Bay is an indentation of the Oregon coast about 6 miles long and 3 miles wide, with a tidal area of about 13 miles. It lies about 50 miles south of the entrance to the Columbia River. At low tide the bay is a succession of sand and mud flats, separated by several channels which gradually shoal at their upper reaches from 1 to 2 feet at low tide. The controlling channel depth on the bar is generally about 14 feet at mean low tide. Vessels drawing from 14 to 15 feet can reach Hobsonville on the Bay City channel, a short distance from the entrance. Originally the controlling depth at ordinary high water between the ocean and Tillamook, on Hoquarten Slough, 12 miles from the entrance, did not exceed 7 or 8 feet.

The original project for the improvement was adopted by the river and harbor act of August 11, 1888, and provided for a survey of the entrance and for the improvement of Dry Stocking Bar and Hoquarten Slough by the building of pile dikes, at an estimated cost of $5,200. The total amount expended on this project was $5,700.

The second project, adopted by the act of July 13, 1892, provided for connecting the north and middle channels nearly opposite Bay City, on the north shore of Tillamook Bay, putting in dikes at Junction and Dry Stocking Bars, and contemplated a least depth of 9 feet at mean high tide from Hobsonville to Tillamook, on Hoquarten Slough. The estimated cost was $100,000.

The amount expended on this project at the close of the fiscal year ending June 30, 1912, was $136,142.51, of which amount $63,669.14 was applied to maintenance. There was received from sales the sum of $20.

The river and harbor act approved July 25, 1912, adopted a new project, printed as House Document No. 349, Sixty-second Congress, second session, which contemplates the construction of a north jetty at the entrance to the bay, and dredging the channel to Bay City 16 feet deep and 200 feet wide, increased at the entrance and at curves, at a total cost of $814,000, with $5,000 annually for maintenance, the local interests cooperating to the extent of paying one-half the cost, and of creating and maintaining a depth of 9 feet at mean high water between Bay City and Tillamook. An appropriation of $100,000 is carried in the act, and when an equal amount is furnished by the local interests active operations will be commenced on the project.

The work of repairing the dredge, which was in progress at the end of last fiscal year, was completed about August 31, 1911, the dredge placed in commission, and operated on Government funds during the month of September, 1911, having dredged 8,320 cubic yards of material from the channel of Hoquarten Slough. On October 1, 1911, owing to lack of available funds, the dredge was turned over to the port of Tillamook, to be operated at its expense in maintaining the projected channel between Tillamook and Bay City. Seventy-three thousand seven hundred and sixty-three cubic yards of material was removed up to June 25, 1912, when the dredge was laid up, owing to lack of funds to continue the work.

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[1] Exclusive of amount available for fiscal year 1913.

All of the work contemplated by the project of 1892 has been completed, and, except as shoals are formed by each freshet, boats have experienced little difficulty in reaching Tillamook at high tide on a draft of 9 feet. The average range of tide is 6.2 feet. The head of navigation for ocean-going vessels is at Tillamook, about 12 miles from the entrance.

Lumbering is one of the chief industries, and logging is extensively carried on, most of the tributaries of Tillamook Bay being used as a means of floating logs down to tidewater.

The commerce on Tillamook Bay consists of lumber and dairy products shipped to Portland and San Francisco and general merchandise brought in by coasting vessels. During the calendar year this traffic amounted to 26,024 short tons, valued at $2,630,480.

There is now railroad connection with Tillamook Bay, the line connecting with the Southern Pacific at Hillsboro, 21 miles west of Portland, having been completed in the fall of 1911.

The estimate submitted for expenditure in the fiscal year ending June 30, 1914, is the amount required to complete the new project adopted by the act of July 25, 1912, all of which ($307,000), it is believed, should be made available at the same time for either contract or expenditure, as circumstances may determine.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Bay and bar [1]	House	185	Fiftieth	First	1888	[illegible]
Do	do	[2] 35	Fifty-second	do	1892 [1]	[illegible]
Do	do	[2] 217	Fifty-fifth	Second	1898 [1]	[illegible]
Entrance					1903 [1]	[illegible]
Bay and bar to Tillamook	House	[1] 965	Sixtieth	First		
Do	(3)	[1] 13	Sixty-first	Second[4]		
Bay and bar	House	[2] 349	Sixty-second	do		

[1] No maps. [2] Contains maps. [3] Committee on Rivers and Harbors.

Comparative statement of traffic.

Calendar year	Short tons.	Estimated value.	Calendar year.	Short tons.	Estimated value.
1902	24,883		1907	22,917	[illegible]
1903	16,862		1908	19,400	[illegible]
1904	13,823	$658,489	1909	25,025	[illegible]
1905	13,919	696,760	1910	21,898	[illegible]
1906	13,627	850,240	1911	26,024	[illegible]

July 1, 1911, balance unexpended	$4,848.55
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	4,671.20
July 1, 1912, balance unexpended	177.35
July 1, 1912, outstanding liabilities	42.00
July 1, 1912, balance available	135.35
Amount appropriated by river and harbor act approved July 25, 1912	105,000.00
Amount available for fiscal year ending June 30, 1913	105,135.35
Amount (estimated) required to be appropriated for completion of existing project	[1] 307,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 307,000.00

(See Appendix T T 5.)

6. *Snake River, Oreg., Wash., and Idaho.*—The Snake River rises near the Yellowstone National Park, in the western part of the State of Wyoming, flows in a general westerly direction for a distance of about 1,300 miles, and empties into Columbia River about 20 miles north of the northern boundary of the State of Oregon.

The portion of the river under improvement extends from its junction with the Columbia to Pittsburg Landing, a distance of about 216 miles. The upper portion runs through a mountainous country and is much obstructed by gravel shoals, ledges of bedrock, bowlders, and numerous rapids. The country through which the river passes, between Riparia and its mouth, is more open, but navigation is difficult, owing to the swift current and numerous rapids. Some of the channels through the rapids are narrow and crooked, and before improvement were practically impassable at low water, owing to the rocky ledges, gravel shoals, and bowlders. The Snake and Columbia Rivers, in early days, formed the natural highway for the traffic between the inland empire and the Pacific coast, and navigation on the Snake River, notwithstanding the difficulties, continued until the completion of the railroad to Riparia in 1882, after which boats abandoned the river below that point.

A detailed description of the river prior to and during the early years of improvement will be found in the Annual Report of the Chief of Engineers for 1880, page 2293, and 1891, page 3212.

In 1877 a project was approved for removing reefs and bowlders and for scraping gravel bars in the Columbia and Snake Rivers between Celilo, Oreg., and Lewiston, Idaho, a distance of 263 miles, at an estimated cost of $132,000. Since 1882 operations on the Snake River have been confined to the stretch above Riparia. In 1892 the project was extended to include the improvement of the 7 miles of river between Lewiston, Idaho, and Asotin, Wash., and the act of June 13, 1902, further provided for extending the improvement to Pittsburg Landing. The project now provides for completing and maintaining the improvement between Lewiston and Riparia, with a view to obtaining a low-water depth of 5 feet, by means of blasting, dredging, raking, and by contraction works, and for general improvement up to Pittsburg Landing. The work between Riparia and Pittsburg Landing is based on surveys made in 1900, 1902, and 1905, between Riparia and Lewiston, between Lewiston and Imnaha River, and between Imnaha River and Pittsburg Landing, at an estimated cost of $23,000, $33,690, and $15,000, respectively.

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[1] Exclusive of amount available for fiscal year 1913.

In 1907 the Washington State Legislature appropriated $100,000 for expenditure between Riparia and the mouth, but of this sum only $85,000 was used, the final requisition for $15,000 not being honored by the State auditor for the reason that it had lapsed on April 30, 1909, prior to the requisition. This appropriation was made as the result of a general disposition to revive navigation below Riparia and utilize the State Portage Road, which was built in 1905, around the obstructions in the Columbia between Celilo and Big Eddy. The project for this portion of the river, which was formulated for the especial purpose of expending the above-mentioned appropriation, is based on the survey made in 1897, and is a continuation of general open-river work.

The amount expended on the original and modified projects to the close of the fiscal year was $314,510.34 under the national appropriation and $85,000 under appropriation made by the State of Washington.

There has been received from miscellaneous sources, on account of sales, $825.70.

Operations during the past year consisted in blasting out submerged reefs and rocks and in scraping bars, removing bowlders, etc. This work was carried on by the self-propelling dredge *Wallowa* and steamer *Umatilla*, belonging to the United States, and by drill scow *No. 2*, constructed with funds appropriated by the State of Washington, the steamer *Umatilla* working only during such time as it could be spared from work on the Columbia River. A total of 1,289 cubic yards of rock was removed from obstructing reefs and rapids, 115 tons of stone placed in the different dams, and the most troublesome shoals improved by dragging with channel rake. Work was commenced the middle of July, 1911, and continued until November, 1911, when it was discontinued, owing to a shortage of funds, and the plant was transferred to the Columbia River for work there. The dredge *Wallowa* was taken to Riparia for extensive repairs to the bottom planking and frame of the hull, at a cost of about $2,500. The work done resulted in improving the conditions and in making a safer and more navigable channel between Riparia and the mouth of the river. It is estimated that the project is about two-thirds completed.

The maximum draft that could be carried June 30, 1912, over the shoalest point between the mouth and Riparia was 28 inches; between Riparia and Asotin, 40 inches, and between Asotin and Pittsburg Landing, 24 inches.

The Snake River is in freshet during the summer months from melting snow in the mountains, and during these freshets the variation of the water levels is usually about 20 feet. The head of navigation during proper stages is at Pittsburg Landing, about 216 miles above the mouth, but only intermittent trips are made to that point, regular traffic being carried on only as far up as Lewiston. There is no logging or rafting on the Snake River, but logs are floated down the Clearwater River to the mills near Lewiston.

The Open River Transportation Co., a corporation organized for the purpose of navigating the river, is now operating a line of boats between Portland, Oreg., and The Dalles, and have two powerful light-draft boats, the *Inland Empire* and the *Twin Cities*, for use on the upper river. These latter boats run between Lewiston and Celilo, and exchange cargoes with the lower river boats by means of the State Portage Road between Celilo and The Dalles.

The Oregon-Washington Railroad & Navigation Co. has operated its two steamboats, the *Lewiston* and *Spokane*, during favorable stages between Riparia and Asotin, calling at points on the opposite bank from the railroad.

The Spokane, Portland & Seattle Railway Co. has completed a line from the mouth of Snake River to Riparia, on the north bank of the river, and has traffic arrangements with the line between Riparia and Lewiston.

Since operation of the Open River Transportation Co.'s boats a reduction of about 14 per cent in freight rates has been made, which reduction has been met by rail lines.

The commerce transported on the Snake River during the calendar year amounted to 30,723 short tons, and consisted principally of farm and mill machinery, grain, fruit, and general merchandise, valued at approximately $1,020,109.

The amount required for expenditure for the next fiscal year will be applied to the removal of obstructions, for maintenance, and improvement, and the proposed work is essential in order to make the improvement available.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to Lewiston					1880 [1]	2296
Lewiston to mouth of Salmon River					1882 [2]	2716
Lewiston to mouth of Boise River, Idaho.					1885 [2]	2440
Mouth to Riparia	House	[1] 411	Fifty-fifth	Second	1898 [2]	3013
Asotin, Wash., to Pittsburg Landing, Idaho.	do	[1] 75	Fifty-sixth	First	1900	4333
Riparia to Lewiston [2]	do	127	do	Second	1901	3525
Lewiston to mouth of Imnaha River.[2]					1903	2246
Imnaha River to Pittsburg Landing[2]					1906	1986

[1] Contains maps. [2] No maps.

Comparative statement of traffic carried on Snake River.

Calendar year.	Short tons.	Estimated value.	Calendar year.	Short tons.	Estimated value.
1902	37,824		1907	39,228	
1903	44,379		1908	46,825	
1904	48,547	$1,789,677	1909	35,245	$1,026,086
1905	28,330	1,191,960	1910	28,073	887,365
1906	71,556	2,671,882	1911	30,723	1,020,109

July 1, 1911, balance unexpended		$14,301.37
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$7,043.01	
For maintenance of improvement	5,000.00	
		12,043.01
July 1, 1912, balance unexpended		2,258.36
July 1, 1912, outstanding liabilities		450.00
July 1, 1912, balance available		1,808.36
Amount appropriated by river and harbor act approved July 25, 1912		25,000.00
Amount available for fiscal year ending June 30, 1913		26,808.36
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1]25,000.00

(See Appendix T T 6.)

7. *Columbia River and tributaries above Celilo Falls to the mouth of the Snake River, Oregon and Washington.*—Columbia River rises in the southeastern part of British Columbia, flows in a northwesterly direction for about 150 miles, thence in a general southerly direction for about 600 miles until it reaches the northern boundary of Oregon, thence in a general westerly direction for about 350 miles, between the States of Oregon and Washington, until it empties into the Pacific Ocean. This stretch of river is 124 miles long, and can be navigated at favorable stages. It abounds in rapids and shoals, which are obstructed by projecting ledges, isolated bowlders, etc. Before the days of railroads the Columbia River formed the main highway for commerce between the inland empire and tidewater, but navigation was always more or less dangerous, and was practically suspended in 1882, on account of the construction of a line of railroad by the Oregon Railroad & Navigation Co., which practically paralleled the south bank and reached as far as Riparia, on the Snake River, about 72 miles below Lewiston. The lower end of this project is about 200 miles from the mouth of Columbia River.

The first project was adopted by act of June 10, 1872, and in 1877 was modified to include the improvement of the Snake River. This project provided for the improvement of the most troublesome rapids by the removal of obstructing reefs and bowlders, and in this work approximately $120,000 was expended up to the time of the suspension of navigation in 1882.

The existing project is based on the survey authorized by act of March 3, 1905, and was adopted by act of March 2, 1907. It proposes to facilitate navigation by the removal of obstructing bowlders and ledges, and raking the gravel shoals in order to make safe and available the channel that now exists, at an estimated cost of $400,000. In 1907 the State Legislature of Washington appropriated the sum of $25,000 for expenditure in the vicinity of Umatilla Rapids, in order to expedite the work under the general project.

The amount expended on the present project to the end of the fiscal year under the national appropriation was $204,805.80, and under the appropriation by the State of Washington, $25,000.

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[1] Exclusive of amount available for fiscal year 1913.

This work is carried on in close connection with Snake River improvement, the plant being used on either work, dependent upon freshet conditions. Steamer *Umatilla*, self-propelling dredge *Wallowa*, and drill scows *Nos. 1*, *2*, and *3* were used on this portion of the river.

Drill scow *No. 1* worked the entire season at Upper Umatilla Rapids. Steamer *Umatilla* worked at Homly, John Day and Biggs Rapids, and in front of Umatilla. Dredge *Wallowa* struck a reef while being transferred to the Columbia River work, and after repairs were made worked the balance of the season at Squally Hook Rapids. Drill scow *No. 2* worked at Homly Rapids from about November 1 to middle of February. Drill scow *No. 3* worked at Canoe Encampment and Squally Hook Rapids. All work was suspended the latter part of February, owing to high water, and the plant laid up. A total of 4,708 cubic yards of blasted rock was removed, 626 drags made with channel rake, and 1,539 tons of rock placed in dam at Homly Rapids. It is estimated that at the end of the fiscal year the project is about 57 per cent completed.

The work accomplished has resulted in improving the channel through some of the most troublesome shoals, mainly Homly, Umatilla, Devils Bend, Squally Hook, John Day, Canoe Encampment, and Biggs Rapids, giving a least depth of 4½ feet at low water, and has lessened to a considerable extent the dangers that previously existed. During the summer months the river is in freshet, and the extreme variation of the water surfaces at that time is about 34 feet above low water. The head of low-water navigation for boats using this portion of the stream is at Asotin, on the Snake River, 269 miles above Celilo, and approximately 473 miles from the sea. On higher stages boats ascend the Snake River as far as Pittsburgh Landing, a farther distance of about 70 miles. There is no logging on this stretch of river.

During the past year the Open River Transportation Co. has operated its two light-draft steamboats, the *Inland Empire* and the *Twin Cities*. The boats were laid up for a short time during the extreme low water and cold weather in winter, but resumed operations again as soon as conditions were favorable, running between Celilo on the Columbia River and Lewiston on the Snake River, with a branch service between Kennewick and Priest Rapids, on the Columbia River.

The Open River Transportation Co. claims to have made a reduction of 14 per cent on freight rates since beginning operations. The railroads have made similar reduction in their rates to points on the river. These boats report handling 16,411 short tons of general merchandise, farm products, etc., during the calendar year 1911, valued at $671,294.

The amount required for expenditure is to be applied to prosecution of work under the approved project, and is an extension of benefits resulting from removal of obstructing rocks and shoals. The whole amount should therefore be made available.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Celilo to Snake[1]					1877 1880	186 228
Do.[1]	House.	440	Fifty-ninth	Second		

[1] No maps.

Comparative statement of traffic carried on Columbia River above Celilo to mouth of Snake River.

Calendar year.	Short tons.	Estimated value.
1907	7,776	
1908	1,349	
1909	8,421	$535,840
1910	13,580	562,357
1911	16,411	671,294

July 1, 1911, balance unexpended	$79,346.51
June 30, 1912, amount expended during fiscal year, for works of improvement	49,152.31
July 1, 1912, balance unexpended	30,194.20
July 1, 1912, outstanding liabilities	1,250.00
July 1, 1912, balance available	28,944.20
Amount appropriated by river and harbor act approved July 25, 1912	50,000.00
Amount available for fiscal year ending June 30, 1913	78,944.20
Amount (estimated) required to be appropriated for completion of existing project	[1]115,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	60,000.00

(See Appendix T T 7.)

8. *Columbia River between the foot of The Dalles Rapids and the head of Celilo Falls, Oreg. and Wash.*—Columbia River rises in the southeastern part of British Columbia, flows in a northwesterly direction for about 150 miles, thence in a general southerly direction for about 600 miles until it reaches the northern boundary of Oregon, thence in a general westerly direction for about 350 miles, between the States of Oregon and Washington, until it empties into the Pacific Ocean.

The object of this improvement is to overcome the obstructions in the 12 miles between the foot of Threemile Rapids and the head of Calilo Falls. There are four principal obstructions—Threemile Rapids, a crooked channel 1,500 feet in length, narrow, and obstructed by rocks and currents; Fivemile Rapids (The Dalles) where for 1½ miles the river rushes with great velocity between precipitous walls of basalt 150 to 300 feet apart; Tenmile Rapids, a similar gorge, but only one-half mile in length; Celilo Falls, with a sheer fall of 20 feet. The total fall is about 81 feet at low water and 60 feet at high stages. It can not be navigated at any stage. The distance of the lower end of the section included in the project from the mouth of the river is about 192 miles.

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[1] Exclusive of amount available for fiscal year 1913.

The first project was adopted by act of August 18, 1894, and contemplated the construction of a boat railway capable of transporting boats of 600 tons. There was appropriated $100,000 for purchasing the right of way and beginning construction. The act of June 3, 1896, made an additional appropriation of $150,000. A preliminary examination and survey was authorized by act of June 6, 1900, with a view to the construction of a canal and locks. The report submitted under this act is printed in the Annual Report of the Chief of Engineers for 1901, Part 5, page 3502 (no maps), and House Document No. 228, Fifty-sixth Congress, second session (containing maps).

It proposes the construction of a short canal and locks around The Dalles, or Fivemile Rapids, and another around the falls at Celilo, with intermediate river improvement, at an estimated cost of $3,969,371. The amount expended on previous projects prior to the adoption of the present project was $27,112.83.

The existing project, as adopted by Congress in the act approved March 3, 1905, provides for a continuous canal on the Oregon shore, between the pool above Celilo and the pool below Fivemile Rapids, with open-river improvement at Threemile Rapids. It is based on report of a board appointed to revise the preceding project with a view, if possible, of reducing the cost. The report of this board is printed in the Annual Report of the Chief of Engineers for 1904, page 3475 et seq. (No maps.)

The proposed canal was to be about 8½ miles long, 65 feet wide on the bottom, and 8 feet deep; with four locks 250 feet long between quoin posts and 40 feet wide in the clear, with a depth of 7 feet of water over the miter sills. The estimated cost was $4,125,000. The approval of the project by the Chief of Engineers on May 8, 1905, for beginning actual canal construction included increasing the length of the locks to 300 feet between hollow quoins with a clear width of 45 feet. Plans for modifying certain details of the original project were approved by the Chief of Engineers May 15, 1908. These modifications embodied a reduction in curvature of canal axis, the substitution of concrete-lined embankments for heavy masonry walls, and the installation of an extra lock to be located at Tenmile Rapids.

As modified, the existing project includes open-river improvement at Threemile Rapids and a continuous canal on the Oregon shore between the pool above Celilo and the pool below Fivemile Rapids; the canal to have a depth of 8 feet, width of 65 feet at the bottom, and length of 8½ miles, with 5 locks 300 feet by 45 feet (50 feet for Tenmile Lock) by 7 feet over miter sills, two of which will be located at the lower end of the canal, one at Fivemile Rapids, one at Tenmile Rapids, and one at Celilo Falls, at an estimated cost of $4,845,000.

The operations during the past fiscal year have consisted of open-river improvement at Threemile Rapids and construction work on

The Dalles-Celilo Canal. The former work was done under contract by Robert Wakefield, and consisted in the removal of rock from submerged reefs and main shore of the river. The amount expended for this work during the fiscal year was $15,150.25.

The canal construction work was carried on by method of hired labor and purchase of materials. The work accomplished in addition to engineering and construction and care of buildings, installation and repair of plant, etc., consisted of excavation for locks and canal trunk, building of embankments for canal, control of drifting sand dunes, and construction of masonry walls. The expenditure for the fiscal year on this account was $634,533.13, including plant, buildings, supplies, labor, superintendence, etc.

The amount expended on the present project to the end of the fiscal year was $2,392,035.68, of which $31,279.81 was applied to surveying, preparing plans, etc., before its adoption. There has been received on account of sales of blueprints, etc., the total sum of $1,005.93.

Under contract let in 1904 and completed in March, 1908, there was removed 50,970 cubic yards of rock from the rocky ledges in the vicinity of Threemile Rapids, in order to give a channel at least 10 feet deep at low water and from 200 to 250 feet wide.

Investigation made in 1908, based on complaints of steamboat men, developed the fact that further open-river work was needed in the vicinity of Threemile Rapids, and a formal contract was authorized. This contract, made under date of October 14, 1909, was completed March 30, 1912. A total of 13,379.28 cubic yards of rock was removed. The total amount expended on the project at this point is approximately $167,726.25.

Under contract let August 10, 1905, and completed on May 11, 1910, there was constructed about 2,500 feet of the upper end of canal, complete, except lock gates.

Under contract let September 18, 1908, there was completed about 14,000 feet of canal, omitting the concrete lining where canal is in embankment. The contractor completed the requirements of contract on May 1, 1911.

Canal construction work has also been prosecuted by hired labor since July 16, 1910.

It is estimated that on June 30, 1912, the approved project was about 55 per cent completed, but no advantages have been derived from the expenditures, except the benefit furnished by the improvement at Threemile Rapids, where a least channel depth of 10 feet at low water, canal datum, has been obtained. The variation of the water surfaces from extreme low water to extreme high water is about 32 to 90 feet at different points. Boats are now operating between Portland and The Dalles, and between Celilo and Lewiston, 265 miles above Celilo on the Snake River, the cargoes being transported around the obstructions between The Dalles and Celilo by the State Portage Railway, thus furnishing water competition to all intermediate points on the river.

The Columbia River is navigable, in fact, up to the foot of Priest Rapids, about 203 miles above the lower end of the improvement provided for in this project, and the Snake River up to Pittsburg Landing, about 350 miles above the same point.

The Open River Transportation Co. operated two boats during favorable stages between Celilo and Priest Rapids on the Columbia, and to Lewiston, Idaho, on the Snake River. They reported handling, during the calendar year 1911, 67,019 short tons of merchandise, farm products, and machinery, valued at approximately $2,586,245.

The influence of this water transportation has resulted in the reduction of freight rates between competitive railroad points up to Celilo, and as the steamboat service on the upper river is increased a still further reduction is anticipated. The benefits to be derived from the improvement when completed, the country which will be affected, and the probable resources to be developed are all described in House Document No. 228, Fifty-sixth Congress, second session. The irrigation projects now under way and contemplated should, within a few years, increase the farm products and the resultant traffic to very large quantities.

The Oregon Trunk Railway has constructed a bridge over the Columbia River below Celilo to connect its north bank road (of the Hill system) with its new road, now constructed up the Deschutes River, into central and southern Oregon. The company is now operating this line.

The amount required for expenditure is to be applied to continuing the work of canal construction by hired labor and purchase of materials under existing regulations. No benefits can be derived from this work until the canal is completed and opened to navigation.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Columbia River at The Dalles	Senate	[1] 184	Forty-seventh	First	1882–83 [1]	2690
The Dalles to Celilo	House	[2] 73	Fiftieth	Second	1890 [1]	3030
Do	do	[2] 64	Fifty-first	First	1894 [1]	2664
Do	Senate	7	Fifty-third	do	1904 [1]	3475
Do	House	[2] 228	Fifty-sixth	Second	1901 [1]	3501

[1] No maps.

[2] Contains maps.

Comparative statement of traffic handled by Oregon State Portage Ry. between Big Eddy and Celilo, Oreg.

Calendar year.	Short tons.	Estimated value.
1905	3,058	$186,900
1906	5,414	227,900
1907	4,600	185,000
1908	4,056	207,685
1909	25,482	1,023,165
1910	47,506	1,382,970
1911	67,019	2,586,245

July 1, 1911, balance unexpended		$680,605.80
Deposited account sale of lands		935.00
		681,540.80
June 30, 1912, amount expended during fiscal year, for works of improvement	$649,678.38	
Deposited to account of miscellaneous receipts	5.00	
		649,683.38
July 1, 1912, balance unexpended		31,857.42
July 1, 1912, outstanding liabilities		16,500.00
July 1, 1912, balance available		15,357.42
Amount appropriated by river and harbor act approved July 25, 1912		700,000.00
Amount available for fiscal year ending June 30, 1913		715,357.42
Amount (estimated) required to be appropriated for completion of existing project		[1] 1,808,392.64
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[1] 600,000.00

(See Appendix T T 8.)

9. *Canal at the Cascades, Columbia River, Oreg.*—This improvement embraces about 4½ miles of the Columbia River where it passes through the Cascade Mountain Range and is contracted into a narrow gorge with steep slopes and swift current. A fall of 24 feet at low water in the upper 2,500 feet of the gorge creates a turbulent rapid which effectually bars upstream navigation and renders downstream navigation unsafe. The lower 4 miles of the gorge is swift and before improvement was unsafe by reason of the obstructing ledges and bowlders. The lower end of this improvement is about 155 miles from the mouth of the river.

The original project was for a canal and locks around the falls. It was adopted in 1877 and modified in 1886 and 1888, and included the improvement of the rapids below the falls to secure a low-water channel of 8 feet. The locks were to be about 462 feet long and 92 feet wide, with a low-water depth of 8 feet over the miter sills.

The existing project is a modification of the original project and is based on report of the Board of Engineers printed in the Annual Report of the Chief of Engineers for 1895, page 3571. It provided for utilizing the upper 426 feet of the uncompleted canal above the lock gates as a second lock, and also in raising the protection work of the canal walls as a safeguard against flood water. The estimated cost of the original project was $2,544,545, and the later modification $413,360.

The amount expended on the original and modified projects to the close of the last fiscal year was $3,823,993.69. There has been received on account of sales the total sum of $11,629.48.

No work was done during the fiscal year on the uncompleted items of the approved project, except to care for the plant and buildings, as sufficient funds for construction work were not available.

The canal and locks were completed and opened to navigation in 1896. There yet remains the building of the land wall of the upper lock, construction of three sets of steps, and completing the paving and grading on the land side of the canal. About 8 feet can be carried at low water through the locks. An annual rise in the Columbia River takes place in May, June, or July, and usually reaches a stage of 40 feet above low water. The head of navigation for boats passing the locks is Big Eddy, about 4 miles above The Dalles. No logs are rafted through the canal, but logging is carried on extensively between Cascade Locks and The Dalles.

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[1] Exclusive of amount available for fiscal year 1913.

Comparative statement of traffic.

Fiscal year ending June 30—	Short tons.	Estimated value.	Passengers.	Fiscal year ending June 30—	Short tons.	Estimated value.	Passengers.
1903	36,181		50,821	1908	54,954	$3,297,240	86,615
1904	31,967		76,971	1909	34,168	2,050,000	70,482
1905	35,166	$2,286,125	64,403	1910	32,794	1,927,352	98,369
1906	46,884	2,813,040	133,070	1911	38,063	2,543,799	96,810
1907	53,770	3,226,200	89,239	1912	41,778	3,034,315	84,925

The commerce through the locks consists of wheat, flour, miscellaneous grain, cattle, horses, wool, country produce, farm and mill machinery, and general merchandise. This commerce amounted during the fiscal year to 41,778 short tons, valued at $3,034,315.

This improvement is a factor in regulating freight rates to all points reached by steamers using the canal and locks.

The additional work required to complete the project is not necessary to make the improvement available, but is essential in order to decrease the volumetric capacity of the upper lock, thus shortening the time of lockage, and to eliminate the danger of the water from the upper lock cutting its way around the cut-off wall extending into the bank at the middle gate.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Cascades and The Dalles of Columbia River.[1]					1875	787
Cascades of Columbia River [1]					1877	1046
Do.[1]					1880	2298
Do.[1]	Senate	72	Fifty-first	Second		
Do.[1]	House	39	Fifty-second	do		
Do.[2]	Senate	26	Fifty-third	Third	1895	3571

[1] No maps.

[2] Contains maps.

July 1, 1911, balance unexpended	$2,355.67
Deposited to official credit, overpayment on voucher	.12
	2,355.79
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	720.00
July 1, 1912, balance unexpended	1,635.79
July 1, 1912, outstanding liabilities	60.00
July 1, 1912, balance available	1,575.79

Amount (estimated) required to be appropriated for completion of existing project	[1] $194,260.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 100,000.00

(See Appendix T T 9.)

10. Operating and care of canals and locks at the Cascades of the Columbia River, Oreg.—The canal and locks around the obstructions in the Columbia River at Cascades, Oreg., were so far completed that they were opened to navigation on November 5, 1896, since which time appropriations have been made under the general work of improvement for further completing the walls and slope, pavement, grading, etc. A general description of the location, dimensions, etc., is given in the preceding report.

Since the opening of the locks more or less dredging has been required, especially at the upper entrance, where an accumulation of sand and silt made navigation difficult at the lower stages of the river.

Dredging operations commenced August 30 and ceased November 28, 1911. The dredge worked a total of 50 days cleaning out the canal entrances, and removed 32,664 cubic yards of material, mostly from the upper entrance to the canal, the dredged material being dumped into the river above the rapids, where it could be carried away by the current. This work resulted in practically clearing both entrances of all deposits. Electric lights were installed in the various quarters and shops. Three hot-air furnaces were installed in the lockkeeper's quarters.

There was expended during the fiscal year the sum of $10,920.79, which was applied to dredging, installing electric lights in the various quarters and shops, building a new boundary fence, installing three hot-air furnaces in the lockkeeper's quarters, general operating expenses, repairs, etc.

The total amount expended from the indefinite appropriation on account of operating, maintenance, repairs, etc., to the close of the fiscal year was $153,908.62.

The commerce through the locks during the fiscal year amounted to 41,778 short tons, valued at approximately $3,034,315. This commerce consisted principally of wheat, flour, miscellaneous grain, cattle, horses, wool, country produce, general merchandise, etc., a detailed statement of which is given in the district officer's report.

(See Appendix T T 10.)

11. Columbia River between Vancouver, Wash., and the mouth of Willamette River.—The city of Vancouver, Wash., is on the north bank of the Columbia River, about 103 miles above its mouth and 5 miles above the junction of the Willamette and Columbia Rivers. Originally vessels drawing about 23 feet could ascend the Columbia River to within about 2½ miles of the city, where there was a bar over which there was only about 9 feet at low water. This bar resulted partly from an excess of width in the main river and partly from a diversion of a portion of the waters to the south side of Hayden Island.

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[1] Exclusive of the balance unexpended July 1, 1912.

The original project, adopted by the act of July 13, 1892, provided for constructing a pile, brush, and rubblestone dike about 3,000 feet in length from the Oregon shore to the head of Hayden Island, opposite Vancouver, in order to stop the flow south of the island during low-water stages, deflect it down the main channel, and scour out the troublesome shoals. This project contemplated a depth of 20 feet or more, but this depth was not realized after the completion of the dike.

The completion of the dike at the head of Hayden Island and revetting the bank to prevent erosion caused considerable scouring on the shoals below Vancouver, but only increased the depth about 1 foot.

The existing project, adopted by the river and harbor act of March 3, 1905, is based on the report of the district officer dated July 22, 1902, approved by the Board of Engineers for Rivers and Harbors, and provided for the maintenance of a channel, 20 feet deep at low water and 150 feet wide, by dredging. The estimate was $60,000 for original work and $10,000 yearly for maintenance of the channel and dike at the head of Hayden Island.

The total amount expended on the original and modified projects to June 30, 1912, was $156,130.95, of which the sum of $58,598.79 was applied to maintenance.

Under the modified project the channel was dredged to the projected depth and width in 1905, and was redredged in the fall of 1906.

No work has been in progress except to make a survey during September, 1910, of the shoal below Vancouver, Wash., which disclosed low-water depths of 9 to 11 feet.

The variation of the water surface at Vancouver, due to tidal influence, is about eight-tenths of a foot at low water. The annual summer freshet, due to melting snow in the mountains, rises to a height of about 20 feet above low water. Steamboats drawing 8 feet can navigate the river as far as The Dalles, about 210 miles from the mouth, by passing through the locks at the Cascades.

The deep-sea tonnage is principally lumber, but during the calendar year 1911 no shipments were made from Vancouver.

The Spokane, Portland & Seattle Railway Co. has extended its line along the north bank of the Columbia and Snake Rivers to Riparia, Wash., and maintains regular freight and passenger service connecting at Kennewick with the Northern Pacific Railway.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Vancouver to Mouth of Willamette	House	[1] 36	Fifty-second	First	1892 [2]	2865
Do	Senate	[1] 54	Fifty-fourth	do	1896 [2]	3264
Do	House	[1] 56	Fifty-eighth	Second	1904 [2]	3467
Do	do	[2] 42	Sixty-second	First		

[1] Contains maps.

[2] No maps.

July 1, 1911, balance unexpended	$14,869.05
July 1, 1912, balance unexpended	14,869.05

(See Appendix T T 11.)

12. Nehalem Bar and entrance to Nehalem Bay, Oreg.—Nehalem Bay is an indentation of the Oregon coast about 2 miles long and 1½ miles wide at the widest part, with a tidal area of about 5½ square miles. It lies about 40 miles south of the entrance to the Columbia River. It is a small estuary at the mouth of the Nehalem River, which rises in the Coast Range of mountains about 30 miles east of the Pacific Ocean and drains an area of about 850 square miles. The bay is connected with the ocean by a shifting channel over a sand flat and has in an unimproved condition furnished channel facilities at high tide for vessels drawing about 10 feet. Navigation has, however, been hazardous as the cycle of changes in the channel has been short. The average range of tide is 5½ feet. The head of navigation for ocean-going vessels is Nehalem, about 7 miles above the entrance.

No work has ever been done on the bar by the General Government, although $10,000 was appropriated in 1890, of which $415.08 was spent for surveys and the remainder reverted to the Treasury.

The Port of Nehalem, a corporation organized under the laws of the State of Oregon, about two years ago, entered upon a project which was approved by the Secretary of War, and started the construction of a rubble stone jetty south of the entrance, and on this work had expended about $85,000 to the close of the fiscal year ending June 30, 1912. Their work has resulted in temporarily fixing the channel across the bar in its most favorable position and slightly increasing its depth.

The existing project was adopted by the river and harbor act of July 25, 1912, and is the project approved by the Secretary of War, on which the Port of Nehalem has been operating. It is fully described in House Document No. 623, Sixty-second Congress, second session, and provides for the construction of two high-tide jetties, the south jetty to be an extension of the one constructed by the Port of Nehalem, and the north jetty to be based on the north spit, at a total estimated cost of $632,350, which includes the cost of the work already done, local interests cooperating to the extent of paying half the cost, receiving credit for the work already done.

The country is sparsely settled, but is heavily timbered with fir, spruce, and hemlock. There is small commerce at present, but it is believed that a large lumber industry will develop with the improvement of the bar channel. Salmon packing and cheese making are also established and growing industries. During the calendar year of 1911 the commerce consisted of about 18,199 short tons of salmon, lumber, cheese, and general merchandise, valued at $398,540.

There is railroad connection by a line recently completed and now in operation, leaving the Southern Pacific line at Hillsboro and passing through Nehalem to a terminus at Tillamook, about 15 miles farther south on the coast.

No work was done on the project during the fiscal year, it having been adopted by Congress subsequent to the close of the year. After the completion of the necessary guaranty required by the act, the construction of the south jetty will be continued. The amount required for expenditure for the fiscal year 1914 is for the completion of the south jetty, and is necessary in the continuation of the project.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.		
	House or Senate.	No.	Congress.	Session.	Year.	Part.	Page.
Nehalem [1]		Ex. 42	Forty-fourth	First	1876	2	639
Do.[1]		Ex. 71	Forty-eighth	Second	1885		2409
Do.[1]					1887		2496
Do.[1]	House	70	Fifty-first	First	1890		2993
Do.[1]					1891		3205
Do.[1]					1892		2703
Do.[2]	House	236	Fifty-fifth	Second	1898		3009
Do.[2]	do	623	Sixty-second	do			

[1] No maps. [2] Contains maps.

Amount appropriated by river and harbor act approved July 25, 1912	$100,000
Amount available for fiscal year ending June 30, 1913	100,000
Amount (estimated) required to be appropriated for completion of existing project	[1] 216,175
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 100,000

(See Appendix T T 12.)

13. Oregon Slough, Oreg.—Oregon Slough is that part of the former channel of Columbia River which separates Hayden Island from the Oregon mainland, and extends for a distance of about 4½ miles from the head to the foot of Hayden Island, emptying back into the Columbia River, about 1 mile above the mouth of the Willamette, and about 103 miles above the mouth of the Columbia. Since the completion of a dike constructed across the upper end of the slough, under a project adopted in 1892 for the improvement of the channel of the Columbia River opposite Vancouver, Wash., the slough has been closed to through navigation except in high stages, and much shoaling has taken place. The low-water period in the slough occurs generally from September to March, and at this stage the tidal influence in the Columbia is felt with a range of about 1 foot. The summer freshet of the Columbia usually begins in May and lasts until August, with an average extreme height of about 20 feet above low water. In the slough there are three silty shoals, with a controlling depth in the existing channel of about 6½ feet at extreme low water.

The existing project was adopted by the river and harbor act of July 25, 1912, and is fully described in House Document No. 712, Sixty-second Congress, second session. It provides for dredging a channel 200 feet wide and 20 feet deep at extreme low water from deep water in the Columbia River to a point above the Portland Union Stock Yards, on the slough, at a total cost of $100,000, with $5,000 annually for maintenance, local interests cooperating to the extent of paying one-half the first cost.

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[1] Exclusive of amount available for fiscal year 1913.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Oregon Slough [1] [2]	House	36	Fifty-second	First	1892	2866
Do.[1]	Senate	54	Fifty-fourth	do	1896	3353
Do.[1]	House	56	Fifty-eighth	Second	1904	3497
Do.[1]	do	712	Sixty-second	do		

[1] Contains maps.

[2] Made in connection with survey of Columbia River from Vancouver to mouth of Willamette River.

No work has been done on the project, as it was adopted by Congress subsequent to the close of the fiscal year.

There are at present on this waterway two large industrial establishments, a saw mill and a meat-packing plant, both of which make use of water transportation during the high stages. It is anticipated that the improvement will greatly increase their use of such transportation and extend its advantages to such other similar plants which may occupy the abutting land, which is excellently adapted to such use. During the calendar year of 1911 the total imports and exports amounted to about 16,508 short tons, valued at $608,735, and consisted principally of lumber, salt, packing-house products, etc.

After the completion of the necessary guaranty required by the act, work under the project will be undertaken and completed, which it is estimated will require about a year's time. The project estimates a maintenance charge of about $5,000 annually, preferably in the shape of a biennial appropriation of $10,000, which will not be required until at least a year after the completion of the work.

Amount appropriated by river and harbor act approved July 25, 1912	$50,000
Amount available for fiscal year ending June 30, 1913	50,000

(See Appendix T T 13.)

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and surveys required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. *Preliminary examination of Umpqua River, Oreg., from Scottsburg to Roseburg, Oreg.*—Report dated November 23, 1910, is printed in House Document No. 276, Sixty-second Congress, second session. The improvement of this locality by the United States in the manner proposed is not deemed advisable at the present time.

2. *Preliminary examination of Coos Bay and Entrance, Oreg., including the removal of Guano Rock.*—Report dated December 5, 1910, is printed in House Document No. 284, Sixty-second Congress,

second session. The improvement by the United States of this locality in the manner proposed is not deemed advisable at the present time.

3. Preliminary examination and survey of Oregon Slough branch of Columbia River, Oreg., including a consideration of any proposition for cooperation by localities affected thereby.—Reports dated November 14, 1911, and March 20, 1912, with map, are printed in House Document No. 712, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $100,000 for first construction, with $5,000 annually for maintenance, provided local interests cooperate to the extent of one-half the estimated first cost ($50,000), is presented.

EXAMINATION, WITH PLAN AND ESTIMATE OF COST OF IMPROVEMENT, MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports dated October 2, 1910, and December 30, 1910, with map, by a board of engineers, on preliminary examination, with plan and estimate of cost of improvement, of *Tillamook Bay and Bar, Oreg., with a view to securing channel depths of 15 and 20 feet*, respectively, together with a supplemental report dated June 14, 1911, by Maj. Jay J. Morrow, Corps of Engineers, required by the river and harbor act approved June 25, 1910, were duly submitted and reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law. The reports were transmitted to Congress and printed in House Document No. 349, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $814,000 for first construction, with $5,000 annually for maintenance, subject to certain specified conditions, is presented.

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Reports on preliminary examinations and surveys required by the river and harbor act approved February 27, 1911, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated:

1. Preliminary examination and survey of Yaquina River, Oreg., from Toledo to Yaquina, with report upon any proposition for cooperation by local interests.—Reports dated August 17 and December 27, 1911, with maps, are printed in House Document No. 519, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $72,000 for first construction and $3,000 biennially for maintenance, subject to certain specified conditions as to cooperation by local interests, is presented.

2. Preliminary examination and survey of Nehalem Bar and Entrance to Nehalem Bay, Oreg., with a view to the improvement of same in cooperation with local interests.—Reports dated August 10, 1911, and January 10, 1912, with map, are printed in House Document No. 623, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $632,350 for first construction, one-half of which ($316,175), including the cost of work already done, to be contributed by local interests, is presented.

3. Preliminary examinations and survey of Oregon Slough branch of Columbia River, Oreg., including a consideration of any proposition for cooperation by localities affected thereby.—Reports dated November 14, 1911, and March 20, 1912, with map, are printed in House Document No. 712, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $100,000 for first construction, with $5,000 annually for maintenance, provided local interests cooperate in this improvement to the extent of one-half the estimated cost ($50,000), is presented.

The local officer was also charged with the duty of making other preliminary examinations and surveys required by the river and harbor acts approved June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. North Fork of Coquille River, Oreg., for a distance of 17 miles up the stream from the mouth.

2. East Fork of Coquille River, Oreg., for a distance of 8 miles up the stream from the mouth.

3. Nehalem River, Oreg.

IMPROVEMENT OF RIVERS AND HARBORS IN THE SECOND PORTLAND, OREGON, DISTRICT.

This district was in the charge of Maj. J. F. McIndoe, Corps of Engineers. Division engineers, Col. John Biddle, Corps of Engineers, to July 20, 1911, and Lieut. Col. Thos. H. Rees, Corps of Engineers, from this date.

1. Willamette River above Portland, and Yamhill River, Oreg.—The Willamette River rises in the Cascade Range, flows northerly and generally parallel to the coast line of the Pacific Ocean, and empties into the Columbia River about 100 miles from the sea. It drains an area between the Coast and Cascade Ranges of approximately 19,550 square miles. The river proper is formed by the junction of three main tributaries, which unite in the vicinity of Eugene; these are the Coast Fork, the Middle Fork, and the McKenzie. Approximate distances are as follows:

	Miles.
Mouth to Portland	12
Portland to Eugene	172
Eugene (up Middle Fork) to source	110
Total length	294

The original project included 172 miles of the river from Eugene to Portland, which latter point is 12 miles from the mouth.

The Yamhill River is a tributary, which has its source in the Coast Range, flows in a northeasterly direction, and enters the Willamette River about 42 miles above Portland. About 12 miles from the mouth the river branches into the North Fork and the South Fork, the source of the former being about 25 miles and the latter 40 miles above the junction. The project covers the lower 18 miles from its mouth to the town of McMinnville, on the South Fork.

Prior to improvement the Willamette was obstructed by drift, snags, rock ledges, and rapids, and gravel shoals, which prevented navigation during low water stages, similar conditions existing on the lower 18 miles of the Yamhill River.

In early days the rivers formed the only means of transportation, and carried large quantities of grain and farm products, notwithstanding the difficulties of navigation.

The depths and width of the channel varied with the stage of water, but it has been stated in former reports that, before improvement, the mouth of the Yamhill River was the head of low-water navigation, with a depth of 2½ feet below the low-water plane, above which point the controlling depth was but 1 foot.

Willamette Falls, 12 miles above Portland, are overcome by locks constructed by private parties in 1873. (See report on improving Willamette River at Willamette Falls.)

The original project for Willamette River was made in 1870, the first appropriation being made by the act of March 3, 1871. This project was modified in 1878 and improvement was carried on up to 1892 by removal of snags and other obstructions, deepening of gravel shoals, and by contraction works, when the project was extended to include the removal of obstructions in the Yamhill River up to McMinnville.

In 1896 the project was revised and up to that time there had been expended on the work the sum of $247,747.51, distributed as follows: $71.373.75 on general improvement under former projects; $165,780.29 under project of 1878; $7,381.17 on Willamette River at Corvallis; and $3,211.30 on removal of obstructions in the Yamhill River.

The present project for Willamette River is based on a report of survey printed in House Document No. 260, Fifty-fourth Congress, first session, with map, and in Annual Report of the Chief of Engineers for 1896, page 3309. Estimated cost $131,697. This project was adopted by the act of June 3, 1896, and provided for dredging, snagging, rock removal, dam and revetment work. This act also provided for the construction of a lock and dam in the Yamhill River near Lafayette, in accordance with report of March 6, 1895, printed with maps in the Annual Report of the Chief of Engineers for 1895, page 3602. Estimated cost, $69,000. The act of March 3, 1899, provided for improvement of the Long Tom River and $3,000 was allotted and expended in the removal of snags and other obstructions. The lock and dam in the Yamhill River were completed in 1900 at a cost of $72,164 and has since been available for navigation.

In 1904 the project was revised, as to cost, and the report, which is printed in the Annual Report of the Chief of Engineers for 1904, page 3529, recommended that the 20-mile stretch of river above Harrisburg be abandoned as not susceptible of improvement at reasonable cost; that work between Harrisburg and Corvallis (33 miles) be confined to snagging to facilitate high-water navigation, and that by dredging, snagging, dam and revetment work at various points a low-water depth of 2½ to 3½ feet be secured and maintained from Corvallis to Oswego (111 miles), and a low-water depth of 12 feet thence to Portland (8 miles). The estimated cost of the work proposed under the revised project, which is practically an extension of previous operations on the Willamette River, was $213,500, with $36,300 annually for maintenance.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
WILLAMETTE RIVER.						
Eugene to Portland [1]					1877	1028
Eugene to Portland [2]					1880	2280
Clackamas Rapids, Ross Island, and near Corvallis.[2]	House	28	Fifty-second	First	1892	2340-2350
Above Oregon City [2]	do	36	do	Second	1893	2529
Opposite Salem [1]	do	120	Fifty-fifth	do	1898	3051
Portland and Oregon City [1]	do	504	Fifty-eighth	do	1904	2559
Opposite Albany [2]	do	476	do	do	1904	2564
Oregon City to Eugene [2]	do	13	Sixty-second	First		
Portland and Oregon City [1]	do	438	do	Second		
YAMHILL RIVER.						
Mouth to McMinnville [2]	do	145	Fifty-second	do	1893	2521
Mouth to McMinnville [1]					1896	3082
Canal and locks (with photographs) [2]					1900	4249
Modification of lock and dam [2]	House	78	Fifty-eighth	Second	1904	2560
LONG TOM RIVER.						
Mouth to the town of Monroe [2]	do	127	Fifty-fifth	do	1898	3045

[1] Contains maps.

[2] No maps.

The existing project is the project of 1896, as modified in 1904, and provides for securing and maintaining by dredging, dam and revetment work, and snagging, a low-water depth of 2½ to 3½ feet from Corvallis to Oswego, and a low-water depth of 12 feet thence to Portland, for snagging only between Corvallis and Harrisburg and for maintenance of channel in Yamhill River up to McMinnville by removal of obstructions. All of the revetments covered by this project have not been constructed.

The river and harbor act approved July 25, 1912, again modified this project in accordance with plan printed in House Document No. 438, Sixty-second Congress, second session, so as to provide for the improvement of the Willamette River between Portland and Oregon City by securing a navigable depth of 6 feet at low water, and a channel width of 150-200 feet below the head of Clackamas Rapids and width of 100 feet above; also the removal of Copeleys Rock, at an estimated cost of $24,000 for first construction, with $2,500 annually for maintenance.

Operations during the fiscal year consisted in completing repairs to the dam at Wheatland, constructing a dam at Careys Bend, and dredging and snagging on the river from Peoria to Portland, 130 miles. There were placed in Wheatland Dam 379 cubic yards of rock, completing the work July 20. A total of 446 cubic yards of concrete in sacks was placed in the dam at Careys Bend, which was completed September 21. The dredge *Champoeg* worked during July, removing 6,754 cubic yards of gravel between Independence and Lamberts Bar. The dredge *Mathloma* was in commission from July 1 to the end of September and from April 1 to the latter part of June, when she was laid up owing to lack of funds. During this period the dredge removed 51,126 cubic yards of material from the Willamette River bars between Independence and Ash Island, 45 miles, and 2,840 cubic yards from the Lafayette Bar on Yamhill River. During the fiscal year 394 snags and 919 overhanging trees were removed from the Willamette River and 21 snags and 270 overhanging trees from the Yamhill River.

The construction of the dam at Careys Bend was new work. Other operations were for maintenance and repairs.

The work accomplished afforded relief to navigation by the removal of shoals and other obstructions, resulting in a nearly continuous service of steamboats to Corvallis during the year.

The total amount expended on the existing project to the close of the fiscal year ending June 30, 1912, was $500,270.69, of which amount $275,331.89 was applied to maintenance. Of this amount $250,257.67 was expended on the project of 1896 (including $72,164 for constructing lock and dam in the Yamhill River and $3,000 expended on the Long Tom River) and $249,713.02 on the modified project of 1904.

Receipts from miscellaneous sources amounted to $562.01.

About 75 per cent of the approved project has been completed. A proposed new revetment at Albany and one at Salem remain to be constructed when conditions require and appropriations permit. The work done on the Williamette River has greatly improved its condition although annual maintenance is required to furnish a navigable channel at medium stages to Corvallis, 119 miles above Portland, and during low water to Independence, 83 miles above Portland, and to Dayton, on the Yamhill, 5 miles above the mouth. The work done on the Yamhill has been the completion of the lock and dam near Lafayette, 8 miles above the mouth, under the project of 1896, and clearing the channel of obstructions.

At low water stage a maximum draft of about 3 feet, 2 feet and 1½ feet can be carried from Portland to Oregon City, Salem, and Corvallis, respectively.

The variation of water surfaces due to freshets is from 20 to 30 feet, while the tide, on low water stages sometimes affects the levels between Portland and Clackamas Rapids to the extent of from 1 to 2 feet.

The improvement covers the whole stretch of the river between Portland and Harrisburg, although the old canal, ½ mile long, constructed by private parties around the falls at Oregon City, may be considered as dividing the navigable portion of the river into two parts, about 12 and 140 miles long, respectively.

The head of navigation on the Willamette is Harrisburg, 152 miles above Portland, but boats reach the former point only on the higher stages. The head of navigation on the Yamhill is McMinnville, 18 miles from the mouth, but boats seldom go above Dayton, 5 miles from the mouth.

The forests adjacent to the Willamette Valley produce large quantities of logs, and almost all of the tributaries are used for logging purposes. The Willamette is navigable for rafting 184 miles, and for floating loose logs, 209 miles above its mouth. Logs come down the Yamhill for a distance of about 50 miles.

The commerce consists of lumber, grain, hay, hops, potatoes, fruit, and garden truck. This commerce, including general merchandise and supplies received and logs towed, amounted during the calendar year 1911 to 875,740 short tons, valued at $9,020,565.

Comparative statement of traffic.

Calendar years.	Short tons.	Estimated value.	Passengers.	Calendar years.	Short tons.	Estimated value.	Passengers.
1901	191,901		108,971	1907	412,846	$8,193,746	41,986
1902	192,227		95,221	1908	408,148	8,014,164	29,029
1903	236,823		66,510	1909	519,250	9,295,384	42,290
1904	332,180	$11,260,196	65,947	1910	787,497	8,332,247	28,714
1905	362,258	12,119,596	67,396	1911	875,740	9,020,565	25,282
1906	383,911	7,591,623	41,160				

The lands of the Willamette Valley are very rich and productive, and the products are annually increasing, as shown by the comparative statement above. The river furnishes an easy means of transportation and is in condition to carry a large proportion of these commodities.

The Southern Pacific Railway parallels the river on each side; and the Oregon Electric Co. is operating an electric line between Portland and Salem. This line has been extended as far as Albany and will soon be operated to that point and eventually to Eugene.

Although the locks in the Yamhill River are little used, these locks, together with the water transportation furnished by the Willamette, are instrumental in reducing the freight rates on all shipments from valley points. Until the United States assumes the operation of the canal and locks around the falls of the Willamette at Oregon City the full effect of the project on freight rates will not be felt. A charge of 50 cents per ton is now made for all freight which passes through the locks.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to completing the improvement of the channel between Portland and Oregon City, in accordance with the new project adopted by the river and harbor act of July 25, 1912, and to the maintenance of this channel; also to such dredging, snagging, and repairs to existing works above Oregon City as are necessary for the maintenance of the available channel. Revised plan and estimate for improving the Willamette River between Oregon City and Eugene, printed in House Document No. 13, Sixty-second Congress, first session, has not been adopted by Congress.

July 1, 1911, balance unexpended		$25,668.66
Received on account of sales		36.40
		25,705.06
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$3,842.12	
For maintenance of improvement	20,819.13	
		24,661.25
July 1, 1912, balance unexpended		1,043.81
July 1, 1912, outstanding liabilities		764.33
July 1, 1912, balance available		279.48
Amount appropriated by river and harbor act approved July 25, 1912		32,000.00
Amount available for fiscal year ending June 30, 1913		32,279.48

Amount (estimated) required to be appropriated for completion of existing project	[1] $67,020.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 42,000.00

(See Appendix U U 1.)

2. Operating and care of lock and dam in Yamhill River, Oreg.—The lock and dam are situated on the Yamhill River, 8 miles above its mouth, and 10 miles below the head of navigation, at McMinnville. It was constructed under appropriation for improving Willamette and Yamhill Rivers, for the purpose of affording low-water navigation to McMinnville. It was completed and opened to navigation in 1900.

During the past fiscal year the lock has been open to navigation, except for 56 days during the fall and winter months, when it was closed on account of high water. The total traffic through the lock amounted to 386.6 short tons of freight and 327 passengers.

In September a boat carrying freight and passengers was placed on the run between Portland and McMinnville. Although this service was discontinued in October it is the first time in several years that regular use has been made of the locks.

The traffic consisted principally of general merchandise taken in and grain and farm products brought out, together with a considerable quantity of logs floated downstream.

Steamer traffic has been practically abandoned since 1902, and the reason given is that boats formerly operating on the Yamhill River now find more profitable business on the Willamette. It is claimed by steamboat interests that the uncertainty of lock operation during the freshet season makes it impossible to compete with railroad rates.

During the year there was expended in operating, care, and maintenance the sum of $895.53, and the total expended for the same purpose to the end of the fiscal year 1912 is $40,292.49.

(See Appendix U U 2.)

3. Willamette River at Willamette Falls, Oreg.—At this point, 12 miles above Portland, there is an abrupt break in the river's bed, where the water pours over a horseshoe-shaped, rocky reef, forming Willamette Falls. The vertical distance between water level above and below the falls is about 41 feet at ordinary low water.

These falls form an obstruction which could be overcome only by some method of artificial improvement, and in 1868 the Willamette Falls Canal & Locks Co. was incorporated under the laws of the State of Oregon, for the purpose of constructing a canal and locks on the west side of the falls. These locks were completed in 1873, at a cost of about $450,000, and are now owned and operated by the Portland Railway Light & Power Co. The locks and canal consist of a flight of four locks, each 210 feet long and 40 feet wide, and having a lift of about 10 feet each. The canal basin above the flight of locks is 1,250 feet in length, a guard lock at the upper end of the basin is 210 feet long, and the upper entrance 1,000 feet in length, making the total length, including the locks and entrance, about 3,500 feet.

A concrete dam has been constructed along the crest of the rocky reef, and the level of the water raised about 18 inches for power purposes. The formation of the land is ideal for power sites, and numerous industries, consisting mainly of lumber, paper, and woolen mills, are located along and adjacent to the canal. It is estimated that the flow is capable of developing from 55,000 to 60,000 horsepower, and the company has established and now operates electric generating plants and leases to the other concerns portions of the water power. The water power is considered by far the most important property right claimed by the present owners.

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[1] Exclusive of amount available for fiscal year 1913.

The Legislative Assembly of the State of Oregon passed an act in February, 1909, appropriating the sum of $300,000, provided the United States appropriate a like sum on or before March 1, 1912.

The river and harbor act of June 25, 1910, appropriated $300,000 for the purchase of the existing locks, or for the purchase of the necessary lands and the construction of a new canal and locks, in the discretion of the Secretary of War. It was further provided that, except for the acquisition of lands and right of way and for surveys, etc., no part of these funds shall be expended until the State of Oregon shall appropriate a like amount for the same purpose.

The treasurer of the State of Oregon has been requested to deposit to the credit of the Treasurer of the United States $200,000 of the State appropriation which is now available; the balance, $100,000, will be included in the State levy of taxes in January, 1913.

Of the amount appropriated, the expenditure of $5,000 was authorized July 30, 1910, to be expended for preliminary work, and the expenditure of $2,000 additional was authorized under date of March 19, 1912. Maps, plans, and estimates were prepared and forwarded by the district officer to the Chief of Engineers on April 24, 1911.

A recommendation made February 10, 1912, that the United States offer to the present owners the sum of $375,000 for the locks, canal, and right of way on the west side, was approved by the Secretary of War, under date of February 15, 1912. The offer was duly made and accepted and the necessary transfer papers are in course of preparation by the owners, the Portland Railway Light & Power Co. The abstract of title has been received and forwarded to the United States district attorney for examination.

The work done during the year consisted in making surveys to obtain data necessary for preparation of plans and estimates for future work, for which $1,369.35 was expended, making the total expended on preliminary work to June 30, 1912, $5,806.48.

The advantages to be derived from this improvement, when completed, and the condition of the canal and locks at the present time are given in the report of preliminary examination, authorized by the act of March 3, 1909, and submitted by the district officer under date of February 23, 1910. This report will be forwarded to Congress at its next session.

The general plan of improvement to be recommended is to obtain a depth of 6 feet over the lower sill of the locks and in the upper basin (the available low-water depth now being about 2 feet), and to construct a concrete wall dividing the upper basin from the factories which use the water for power purposes. But the extent and cost of this improvement will depend upon the action of Congress on this special report referred to.

The commerce through the locks consists of country produce, farm and mill machinery, and general merchandise, and amounted during the calendar year 1911 to 12,358 short tons, valued at $1,084,923. This commerce, however, is only a small portion of the amount that would be affected by the proposed improvement. The river is paralleled on both banks by lines of the Southern Pacific Co. which handle the bulk of the traffic, and a toll of 50 cents per ton on all commodities passing through the canal enables the railroads to maintain rates and practically control the business. Twelve years ago the Chamber of Commerce of Salem, Oreg., estimated that there were 425,585 tons of farm products and 74,520 tons of merchandise affected by the tolls through the locks, and with the subsequent increase in population these figures are probably now greatly exceeded. With free locks and a consequent reduction in both rail and water rates of 50 cents per ton the indirect saving to the producers would amount to thousands of dollars annually.

Reference to former reports of surveys, etc.:

Annual Report for 1900, page 4368 (H. Doc. No. 202), 56th Cong., 2d sess., contains maps); Report of Board of Engineers, Annual Report for 1905, page 2497 (H. Doc. No. 99, 58th Cong., 3d sess.).

July 1, 1911, balance unexpended	$295, 562. 87
June 30, 1912, amount expended during fiscal year, for works of improvement	1, 369. 35
July 1, 1912, balance unexpended	294, 193. 52
July 1, 1912, outstanding liabilities	564. 97
July 1, 1912, balance available	293, 628. 55

(See Appendix U U 3.)

4. Columbia and Lower Willamette Rivers below Portland, Oreg.—The Columbia River rises in British Columbia, flows northerly, then southerly and westerly and forms in its lower portion, for about 330 miles, the boundary between the States of Oregon and Washington, emptying into the Pacific Ocean about 610 miles north of the harbor of San Francisco and about 160 miles south of the Straits of Juan de Fuca. Its estuary forms the largest harbor on the Pacific Coast between those two points and has an area of approximately 14 square miles with a depth of about 24 feet or over at mean lower low water. Its length from its source to the mouth is about 1,000 miles. A description of the Willamette River is given in report on its improvement above Portland, Oreg.

Passing through a gorge in the Cascade Range, the Columbia River forms a natural highway for all commerce originating east of those mountains, and in early days was the only means of transportation. By means of a rail portage around Celilo Falls and also around the rapids near the present site of Cascade Locks, a water outlet was afforded many years ago for the products of the northwest section of the country to Portland and thence by deep sea craft to the markets of the world. The value and availability of the waterway for purposes of commerce at the present time are illustrated by the fact that Portland is one of the principal grain-exporting cities of the United States.

The portions of these rivers covered by the improvement include 12 miles of the Willamette between Portland and its mouth, and 98 miles of the Columbia from the mouth of the Willamette to the Columbia River bar.

Originally the channel between Portland and the sea was obstructed by numerous sand bars which distributed the water over extended areas forming comparatively narrow channels with depths varying from 10 to 15 feet at low water.

Prior to the adoption of the project, dredging had been done for temporary relief, and the sum of $221,780.46 expended for that purpose. The original project was adopted in 1877, with a view to obtaining a channel depth of 20 feet. In 1891 the project was extended, with a view to obtaining a low-water channel of 25 feet, at an estimated cost of $772,464, and the Port of Portland Commission, a corporation existing under the laws of the State of Oregon, was granted permission to assist in the work. On the original and modified project, exclusive of the amounts named above, there has been expended the sum of $1,080,874.11. This does not include any part of the expenditures which have been made by the Port of Portland Commission.

The existing project was adopted by the act of June 13, 1902. It is based on report of survey made in 1900 and printed in the Annual Report of the Chief of Engineers for 1900, page 4418, and in House Document No. 673, Fifty-sixth Congress, first session, with maps. It provides for a 25-foot channel by the construction of contracting works and by dredging. The estimated cost was $2,796,300, with $175,000 as the cost of a new dredge and accessories. The act of June 25, 1910, provided for dredging the west channel at Swan Island for use of log tows and shoal-water boats. The river and harbor act of February 27, 1911, made an appropriation of $350,000 and further extended the project to include the construction of two suitable dredging plants.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate	No.	Congress.	Session.	Year.	Page.
Portland to mouth (original project) [1]					1877	1029
West side Swan Island [1]	House	74	Fifty-first	Second	1891	3373
Portland to mouth (25-foot project) [2]	do	38	Fifty-second	First	1892	2859
Portland to mouth (30-foot project) [2]	do	1278	Sixty-first	Third		

[1] No maps.

[2] Contains maps.

The existing project provides for securing a channel 25 feet deep at low water between Portland and the mouth of the Columbia River by the construction of contracting works and by dredging, for a channel on the west side of Swan Island for use of log tows and shoal-water boats, and for the construction of two suitable dredging plants.

The work carried on during the year has been the completion of the 8-foot channel on west side of Swan Island, dredging in the ship channel for its maintenance by U. S. dredges *Clatsop* and *Chinook* and by the dredges of the Port of Portland Commission, the preparation of plans and specifications for two dredging plants and reconstruction of one tug.

The following is a summary of dredging operations:

	Cubic yards.
Removed from Swan Island channel by dredge *Columbia*, under lease	138, 000
Removed by U. S. dredge *Clatsop* between Astoria and Mount Coffin	1, 631, 088
Removed by U. S. dredge *Chinook* above Fort Stevens	438, 150
Removed by port of Portland dredges between Portland and La Du	2, 581, 152

The work resulted in a channel between Portland and Astoria with a least depth of 26 feet, except at Harrington Point Bar, near the head of the estuary, where a depth of only 24 feet was found at the end of the fiscal year. This was due to the dredge *Clatsop* having ceased dredging on this bar in September, 1911, in order to undergo alterations from a coal burner to an oil burner, and dredging on this bar was not resumed until in June, 1912.

The expenditure during the fiscal year was $174,845.41, all for repairs, alterations, and operations of the U. S. dredge *Clatsop* and for the operation of the U. S. dredge *Chinook* for the maintenance of the channel, except the new work at Swan Island, on which $18,639.65 was expended; the reconstruction and outfitting of tug *G. H. Mendell*, on which $24,603.37 was expended; and the preparation of plans and specifications for two dredging plants, on which $2,000 was expended.

The Port of Portland Commission has placed a contract for an additional 30-inch pipe-line dredge to assist in the new 30-foot project. This dredge will be completed in 1912.

The total amount expended on this project to the end of the fiscal year was $1,206,668.16, which includes $304,385.57 expended by the Philadelphia district for dredge construction; $32,288.40 for dredging the 8-foot channel on the west side of Swan Island; $6,500 for the oil station at Three Tree Point; $24,603.37 for reconstructing the tug *G. H. Mendell* and $2,000 for plans and specifications of dredging plants.

It may be stated that all the above expenditures, except the five items named, have been applied to maintenance, as operations were confined to dredging the channel and making repairs or alterations to controlling works and plant.

The total amount received from miscellaneous sources, account sales, etc., is $4,770.47. For depositing dredged material on shore the sum of $9,941.25 was received, which under a decision of the Comptroller of the Treasury was deposited to the credit of "Miscellaneous receipts."

Plans and specifications for two complete dredging plants, with tenders, pipe lines, pontoons, etc., were completed and submitted, but at the end of the fiscal year had not been finally approved by the Chief of Engineers and the contracts for construction had not been entered into. Of the $320,000 covered by the continuing contract authorization in act of February 27, 1911, $200,000 was carried in the sundry civil act of August 24, 1912, and $120,000 remains to be appropriated.

The dredging has been of great benefit to the deep-sea vessels, as there has been no time during the year when ships could not safely load to a draft of 25 feet by taking advantage of the tide. None of the permanent works provided for in the approved project has been constructed, but with this exception the project may be considered completed as the depth of 25 feet has been practically secured. A new project for a 30-foot channel called for by the act of March 3, 1909, has been submitted to Congress, and was adopted by the river and harbor act of July 25, 1912, the dredging plants provided for in the project having already been authorized by the act approved February 27, 1911.

This project provides for a channel 30 feet deep, 300 feet wide, with a short auxiliary channel 8 feet deep, 300 feet wide, on one side of Swan Island, near Portland, to be accomplished partly by the construction of dikes and revetments, but chiefly by dredging, at an estimated cost of $3,770,000, including $520,000 for construction of two dredges. (Printed in H. Doc. No. 1278, 61st Cong., 3d sess.) As the Port of Portland Commission offers substantial cooperation, the probable first cost of the improvement to the United States will not be more than about $3,000,000.

The ruling depth prior to the summer freshet from Portland to the sea was 24 feet at low water, an increase of about 10 feet since the commencement of the work. By taking advantage of the tide vessels have safely carried a maximum draft of 26½ feet.

The usual variations of water level, due to tides, are from 2 feet at Portland to 7 feet at Astoria, and on account of freshets the variations are from 21 feet at Portland to zero at Astoria.

Length of improved sections:	Miles.
Columbia River Bar to mouth of Willamette River (tidal)	98.00
Mouth of Willamette River to Vancouver, Wash (tidal)	6.00
Falls at Cascade Locks (canal and locks) (nontidal)	.63
Between the foot of Dalles Rapids and head of Celilo Falls (canal and locks) (nontidal)	12.00
Between Celilo and mouth of Snake River (nontidal)	124.00
Between Wenatchee and Bridgeport, Wash. (nontidal)	80.00
Between Bridgeport and Kettle Falls (nontidal)	162.00
Mouth of Wilamette to Portland (tidal)	12.00

The head of deep-water navigation is at Portland, Oreg., on the Willamette River, 110 miles above the mouth of the Columbia. Light-draft boats ascend the Willamette for 150 miles, and by using the State portage road between Celilo and Big Eddy cargoes of light-draft boats, during high stages, reach Pittsburg Landing, a point on the Snake River 537 miles above the mouth of the Columbia. The Columbia and Willamette Rivers, over this stretch, probably form the greatest waterway for logging and rafting purposes in the United States. Lumber and shingle mills are located along the banks, and logs are floated down all the tributaries from points 20 to 90 miles inland and towed to the different mills to be manufactured. During the calendar year 1911 eight rafts of logs and piling timbers, aggregating, approximately, 51,500,000 feet b. m., were made up in the Columbia River and towed to San Francisco and southern California ports.

The export commerce consists principally of grain and lumber, while the imports are composed principally of oriental products, cement, coal, lime, sulphur, etc. The light-draft tonnage is chiefly dairy, farm, and lumber products and miscellaneous machinery and mercantile supplies.

The total commerce handled during the calendar year 1911 amounted to 8,000,914 short tons, valued at approximately $83,157,608.

Compartive statement of traffic handled on Columbia and lower Willamette Rivers, below Portland, Oreg.

Calendar years.	Handled by seagoing vessels.		Handled by river vessels.		Total.	
	Short tons.	Estimated value.	Short tons.	Estimated value.	Short tons.	Estimated value.
1901	669,284		1,534,780		2,204,064	
1902	1,131,426		1,567,336		2,698,762	
1903	832,184		1,596,220		2,428,404	
1904	778,328	$27,281,302	1,905,451	$30,775,609	2,683,779	$58,056,911
1905	946,805	31,786,607	2,313,153	26,712,339	3,259,958	58,498,946
1906	1,200,973	34,407,991	2,331,121	26,377,640	3,532,094	60,785,631
1907	1,664,717	45,000,000	2,586,964	31,583,804	4,251,681	76,583,804
1908	1,688,331	43,000,000	2,927,041	27,509,475	4,615,372	70,509,475
1909	1,597,787	40,200,874	2,865,221	33,261,731	4,463,008	73,462,605
1910	2,440,956	39,765,404	5,393,317	25,116,602	7,834,273	64,882,006
1911	2,449,297	52,104,230	5,551,617	31,053,378	8,000,914	83,157,608

It is not believed that the completion of the project will have any effect on freight rates until greater depths are obtained over the bar at the entrance to the Columbia River, thus allowing the use of ships of greater draft and carrying capacity.

The amount estimated as a profitable expenditure in fiscal year 1914 will be applied to completion of dredging plants, to operation of dredges in securing the 30-foot channel, and to maintenance of such old works as may be necessary to make the improvement available.

July 1, 1911, balance unexpended		$390,353.45
Received account sales		304.70
		390,658.15
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$45,243.02	
For maintenance of improvement	129,602.39	
		174,845.41
July 1, 1912, balance unexpended		215,812.74
July 1, 1912, outstanding liabilities		12,107.00
July 1, 1912, balance available		203,705.74
Amount appropriated by sundry civil act approved Aug. 24, 1912		200,000.00
Amount appropriated by river and harbor act approved July 25, 1912		180,000.00
Amount available for fiscal year ending June 30, 1913		583,705.74
Amount of continuing-contract authorization, act of Feb. 27, 1911		320,000.00
Amount appropriated under such authorization		200,000.00
Amount yet to be appropriated		120,000.00
Amount (estimated) required to be appropriated for completion of existing project		[1] [2] 2,575,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] [3] 280,000.00

(See Appendix U U 4.)

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[1] Exclusive of amount available for fiscal year 1913.
[2] Exclusive of amount to be contributed by the port of Portland.
[3] Of this amount $120,000 is for continuing-contract work authorized by the act of 1911.

5. Mouth of Columbia River, Oreg. and Wash.—The mouth of the Columbia is about 610 miles north of the entrance to San Francisco Harbor and 160 miles south of the Straits of Juan de Fuca, and forms the largest and deepest entrance on the Pacific coast between those two points. The estuary furnishes excellent fresh-water harbor facilities, which also extend up the stream to Portland, Oreg., a distance of 110 miles. A description of the Columbia River is given in the report on Columbia and lower Willamette Rivers below Portland, Oreg.

Prior to the commencement of the work of constructing the south jetty in 1885 there were from one to three channels across the bar, and these channels varied from time to time both in location and depth. The depths were from 19 to 21 feet at low water, while the location shifted through nearly 180° between Cape Disappointment and Point Adams.

The first project was adopted in 1884, and provided for the construction of a low-tide jetty, 4½ miles in length, extending seaward from Point Adams, on the south side of the entrance, and terminating at a point about 3 miles south of Cape Disappointment. It was to be built of rubble stone, with a foundation of brush mattresses. This project was modified in 1893 to provide for raising the jetty to high-tide level, and for building four groins from 500 to 1,000 feet in length on the north side.

The estimated cost was $3,710,000, and the jetty was completed to a length of 4½ miles in 1895, and increased the depth over the bar to 31 feet. The total amount expended on the original project was $1,968,753.14, prior to which $17,500 had been appropriated and expended for survey, etc.

The present project was formulated for the purpose of arresting the shoaling process which commenced soon after the completion of the work, the depth having decreased to about 28 feet in 1899, and the location of the channel having shifted into an unstable position 2 miles north of the 1895 channel. By 1902 the depths had deteriorated to 21 feet at low water.

The first appropriation for a new project was made by the act of June 6, 1900, when $250,000 was appropriated for repairs, etc., pending a report to be made by a board of engineers. The report of this board, which is printed in the Annual Report of the Chief of Engineers for 1903, pages 2275 et seq., constitutes the existing project, and provides for extending the jetty seaward a farther distance of about 2½ miles. Dredging was also recommended as a temporary expedient, as well as the construction of a north jetty, should it be found necessary at some future time, in order to secure the desired depth of 40 feet, with a practicable width.

This project was approved by the Secretary of War March 16, 1903, and definitely adopted by Congress by act of March 3, 1905.

The estimated cost of the south jetty was $2,260,000; of the north jetty, $1,205,000; of remodeling and operating dredge, $250,000.

The revised estimate, approved April 17, 1909, for completion of the south jetty was $3,529,300, and is based on a report made by the district officer, recommending that the jetty enrockment be raised to at least mid-tide level, and that its crest be given a width of not less than 25 feet, in order to protect the trestle piling from early destruction by storms and teredo. The increased cost is due to the greater amount of stone required, the increase in cost of materials, and the heavy loss, during construction in previous years, due to destruction of the trestle by winter storms and teredo. In some places the jetty was built in depths as great as 65 feet, and with 15 feet increase in the width of its crest it becomes at once evident that an enormous increase in the amount of rock is required.

References to examination or survey reports and maps or plans not in project documents.

Mouth of Columbia River.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Report of survey [1]	Senate	50	Forty-fifth	Third	1879	1868
Do.[1]	do	84	Forty-sixth	Second	1880	2318
Report of Board of Engineers [2]	do	49	do	Third	1881	2548
Do.[2]	do	18	Forty-seventh	Second	1883	2012
Original condition [2]					1886	1976
Special report—status of the work [1]	House	101	Fifty-first	First	1890	3025
Report of Board of Engineers recommending construction of groins.[1]					1898	3499
Map of completed project of 1884–1893.[2]					1895	3560
Examination and survey (40-foot project).[2]	House	94	Fifty-sixth	First	1900	4430
Report of Board of Engineers [2]					1903	2275

[1] Without maps.

[2] With maps.

The existing project provides for extending the south jetty to a length of about 7 miles, the height to be not less than mid-tide level and width of crest not less than 25 feet; for constructing a north jetty about 2½ miles long, and for dredging to assist the jetties in securing a depth of 40 feet across the bar at mean lower low tide.

During the first half of the fiscal year the trestle tramway was extended 87 bents, from station 355 + 72 to station 371 + 38. Thirty bents were taken up before the beginning of winter to prevent loss during winter storms. During the winter two bents were carried away and before the end of the fiscal year 17 bents were replaced, making the end of the trestle at station 368 + 68 (bent No. 2135). In the spring of 1912, the the tramway for two groins was also constructed, one at station 309 + 33 and the other at station 333 + 46. The length of tramway for each groin was 594 feet. Six bents of jetty tramway which were carried away by the schooner *Admiral* were also rebuilt and about 250 piles driven to strengthen the older parts of the trestle or to replace piles carried away by storms.

A total of 716,420 tons of stone was received under contract and dumped in the jetty. The enrockment was extended from station 358 + 60 to station 371+ 38 (bent 2150), which was the extreme end of the apron at the end of the fiscal year. The enrockment of groin No. 6 was built to an average height of 7 feet above mean lower low tide and of groin No. 7 to an average height of 5 feet. A large amount of rock was used in filling up low places in the older parts of the jetty and in feeding the slopes flattened by the storms. The subsidence of the enrockment appeared to be much less during the winter than during the previous year, except at the outer end where the work is new.

Rock work was suspended between December 16, 1911, and April 16, 1912, on account of inclement weather.

The U. S. dredge *Chinook* worked on the bar 115 days during the year, removing a total of 542,748 cubic yards of sand.

The annual survey of the bar was commenced June 11 and completed June 22. It shows that the opening through the bar between 24-foot contours has increased during the past year from 8,000 to 10,000 feet. The location of the best channel has not shifted during the year, and the controlling depth of the best channel remains 27½ feet, with a width of about 1,000 feet. There is a clear channel width of 5,000 feet with a least depth of 26 feet as compared with a channel width of 4,000 feet with a least depth of 25½ feet last year. The middle ground found inside the bar last year has almost entirely disappeared, decreasing the distance between 30-foot contours inside and outside the bar from 9,000 to about 5,000 feet.

A copy of the map of the survey is transmitted with the district officer's report, also two maps showing comparisons between the 24-foot and 30-foot contours of this survey and of the surveys made in June, 1900, 1910, and 1911.

A survey of Bakers Bay was made to secure data upon which to base the general plan for receiving stone for the construction of the north jetty. The initial work of clearing the brush and grading the site for terminal yards, etc., has been commenced and the plans for buildings, docks, and tracks are well advanced.

All of the expenditures during the year were for new work, except $80,251.82 expended for repairs and operation of the dredge *Chinook*, which may be considered as applied to maintenance of channel.

There has been expended on the existing project to the end of the fiscal year the sum of $7,865,112.16, of which $287,564.10 was expended for alterations, repairs, and operation of the dredge *Chinook*, and may be considered as applied to maintenance. The portion derived from miscellaneous sources, account of sales, amounted to $1,870.94.

The proportion of the project accomplished to the end of the fiscal year is approximately 92 per cent for south jetty and less than 1 per cent for north jetty.

The advantage derived from the improvement has been the increase of about 9 feet in depth on the bar since the adoption of the project.

While the depth in the best channel, referred to the plane of mean lower low water, is not less than 27½ feet, the maximum draft that can be safely carried across the bar on June 30, 1912, may be stated as 25 feet. The plane of mean low water is about 1.3 feet higher than the plane of mean lower low water to which soundings are reduced on the maps.

By taking advantage of the tide, a draft of 27 feet can be safely carried in ordinary weather.

The variation of the level of water surface, due to tides, is about 7.4 feet. The head of navigation for deep-sea vessels crossing the bar is at Portland, 110 miles above the mouth.

Comparative statement of traffic over Columbia River Bar.

Calendar years.	Short tons.	Estimated value.	Calendar years.	Short tons.	Estimated value.
1901	669,284		1907	1,664,717	$45,000,000
1902	1,131,426		1908	1,686,881	48,000,000
1903	882,184		1909	1,597,787	40,200,874
1904	778,328	$27,281,302	1910	2,440,956	39,765,404
1905	946,805	31,786,607	1911	2,449,297	52,104,230
1906	1,200,973	34,407,991			

Deepening of the channel over the bar will admit of the use of ships of greater draft and increased carrying capacity, and with larger vessels frequenting the port it is reasonable to suppose that the charter rates on deep-sea tonnage will be reduced, and that the present rail rates on transcontinental shipments may also be reduced.

The life of the trestle is very uncertain and the work of reenforcing the rock must be done before the trestle becomes unserviceable. It is believed that the contraction of the entrance width by the north jetty may be followed by scouring along the north side of south jetty and that for the maintenance of south jetty two or more groins should be provided, each about 500 feet long.

The amount estimated as a profitable expenditure in fiscal year 1914 will be applied to maintenance of south jetty and to continuing work on north jetty, which is necessary in order to secure the depth on the bar provided for in adopted project.

July 1, 1911, balance unexpended		$1,473,753.57
Received on account of sales		262.70
		1,474,016.27
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$1,099,834.81	
For maintenance of improvement	80,251.82	
		1,180,086.63
July 1, 1912, balance unexpended		293,929.64
July 1, 1912, outstanding liabilities		166,310.00
July 1, 1912, balance available		127,619.64
Amount appropriated by river and harbor act approved July 25, 1912		1,000,000.00
Amount available for fiscal year ending June 30, 1913		1,127,619.64
July 1, 1912, amount covered by uncompleted contracts		12,950.43
Amount (estimated) required to be appropriated for completion of existing project		[1] [2] 955,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 1,000,000.00

(See Appendix U U 5.)

6. Clatskanie River, Oreg.—The Clatskanie River rises on the west slope of the Coast Range, flows northwesterly for a distance of about 28 miles, and empties into the Columbia, through Beaver and Wallace Sloughs, 65 miles below Portland. Before improvement the obstructions to navigation consisted of a single shoal with a depth of but 2 to 3 feet at low water and two sharp bends below the town of Clatskanie. The lower 3 miles is covered by the improvement, and over this stretch the river winds through marshy lowlands in a narrow, tortuous channel, which is available the whole year for boats of light draft.

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[1] Exclusive of amount available for fiscal year 1913.

[2] For north jetty only.

The original project was adopted by the act of March 3, 1899, and provided for dredging out the shoal and cutting off the two sharp bends by means of dredging, at an estimated cost of $13,000.

All of the work contemplated under the above project was completed in 1902, and resulted in giving a depth of 5 feet over the shoalest places, and in making the channel shorter by 4,050 feet, and easier of navigation.

The total expended on this work was $12,675.47, of which sum $868.10 was applied to maintenance.

The existing project, adopted by the river and harbor act of June 25, 1910, provides for improvement by dredging between the town of Clatskanie and the railroad bridge, a distance of about 1 mile, at an estimated cost of $4,200, with $1,000 annually for maintenance. This project provides for obtaining a channel 6 feet in depth at low water, with an average width at the bottom of 40 feet, by the removal of approximately 19,000 cubic yards of material from the shoals, and is printed as House Document No. 633, Sixty-first Congress, second session.

References to examination or survey reports and maps or plans not in project documents are as follows: Report of 1895, page 3596 (H. Doc. No. 330, 53d Cong., 3d sess.); report of 1898, page 3049 (H. Doc. No. 218, 55th Cong., 2d sess., contains map); and report of 1906, page 765 (H. Doc. No. 134, 59th Cong., 1st sess.).

There has been no modification of the existing project since its adoption.

No work was done during the fiscal year and no expenditures were made.

The dredging was completed during November and December, 1910, by the removal of 27,261 cubic yards of material. The total amount expended on this project is $4,299.93, none of which was applied to maintenance.

The improvement has been of great advantage to the boats running to Clatskanie by lessening the delays incident to shoals and crooked channel. Some shoaling has taken place near the head of navigation, and dredging for maintenance of the channel will be required during the next low-water season.

Clatskanie, a small town 3 miles from the mouth, is the head of navigation, and to this point a draft of 6 feet can now be carried at low water.

The whole stretch of the river is tidal, with a variation of water level, due to tides only, of about 5 feet. The backwater of the Columbia during freshet time raises the river to a maximum height of about 10 feet.

The stream is used extensively for logging purposes, as there are fine forests of fir, hemlock, spruce, and cedar along its banks, reaching to the headwaters.

The commerce of Clatskanie River consists principally of sawmill products, farm and dairy products, and general supplies. During the calendar year 1911 this commerce amounted to 38,942 short tons, valued at approximately $572,568.

Comparative statement of traffic.

Calendar years.	Short tons.	Estimated value.	Passengers.	Calendar years.	Short tons.	Estimated value.	Passengers.
1901	51,967		2,136	1907	22,926	$280,616	502
1902	23,790		1,180	1908	46,382	361,492	422
1903	25,765		494	1909	59,927	624,479	271
1904	18,861	$444,210	525	1910	67,057	509,852	310
1905	16,408	612,970		1911	38,942	572,568	471
1906	10,839	216,630					

The Astoria and Columbia River Railroad crosses the valley about 1 mile from the town of Clatskanie, but the greater portion of the business is done by boat, because of the cheaper rate for transportation. The commerce is handled by a boat making three trips per week between the towns of Clatskanie and Portland.

The river and harbor act of July 25, 1912, made provision for the construction of a combined dredge and snag boat, estimated to cost $55,000, which amount is provided by the act, for use in connection with the improvement of the Cowlitz, Lewis, and Clatskanie Rivers, in accordance with recommendation printed in House Document No. 28, Sixty-second Congress, first session.

The balance available, together with the amount contained in the river and harbor act approved July 25, 1912, will be sufficient for the dredging proposed, and therefore no estimate is submitted for additional funds for fiscal year 1914.

July 1, 1911, balance unexpended	$900.07
July 1, 1912, balance unexpended	900.07
Amount appropriated by river and harbor act approved July 25, 1912	1,000.00
Amount available for fiscal year ending June 30, 1913[1]	1,900.07

(See Appendix U U 6.)

7. *Cowlitz and Lewis Rivers, Wash.*—(*a*) Cowlitz River.—The Cowlitz River rises in the Cascade Range, flows southerly for about 60 miles, then westerly for 40 miles, and empties into the Columbia River 64 miles above its mouth and about 45 miles below Portland. Prior to improvement the ruling depth to Toledo, about 40 miles above the mouth, was about 14 inches at low water, and the channel was crooked, narrow at many places, and obstructed by sand and gravel bars, snags, and drift.

The original project was adopted by the act of June 14, 1880, and provided for the removal of sand bars and other obstructions to a point about 50 miles above the mouth, at a cost of $5,000 and an annual expenditure thereafter of $2,000 for maintenance.

The sum of $53,182.93 was expended on the original project, of which $48,183.93 was applied to maintenance.

The present project for improvement from the mouth to Toledo, adopted by the river and harbor act of June 25, 1910, provides for obtaining a channel 4 feet deep from the mouth to Ostrander and 2½ feet thence to Castlerock, by dredging. Estimated cost, $22,000, with $4,000 annually for maintenance. Also between Castlerock and

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[1] For appropriation for dredge and snag boats, see p. 1228, under Cowlitz and Lewis Rivers.

Toledo the project contemplates a channel 40 feet wide and 2½ feet deep at low water, by dredging, snagging, and the construction of a limited number of regulating works to assist in maintaining the channel. Estimated cost, $9,600, with $2,000 annually for maintenance, all in accordance with reports printed in House Documents Nos. 1167, Sixtieth Congress, second session, with maps, and 404, Sixty-first Congress, second session, without maps.

The report upon which original project is based is printed in Senate Document No. 34, Forty-sixth Congress, second session, without maps, also in Annual Report of the Chief of Engineers for 1880, page 2331.

There has been no modification of the existing project since its adoption.

Operations during the fiscal year consisted principally in dredging. Work was in progress with the dredge *Cowlitz* on the lower portion of the river from July 15 to May 2, except for a delay of about 30 days in November and December owing to the sinking of the dredge during a freshet. Conditions being favorable for work on the upper portion, the dredge was moved to Toledo, where she arrived on June 6 and commenced dredging and constructing regulating works. During the year the dredge removed 85,202 cubic yards of sand and gravel from 10 different shoals, removed 28 snags from the channel, and commenced repairs to jetty at Keegans Bar. Between Toledo and Kelso 45 snags were removed in October by means of blasting. The citizens of Kelso and vicinity are cooperating in the improvement at Monticello Bar and during the year completed three pile jetties and one pile and brush jetty at that place.

All the expenditures made during the fiscal year were for new work under the present project, except the cost of raising and repairing the dredge after she was sunk, estimated at $1,640.

The expenditures on the existing project to the close of the fiscal year amounted to $23,174.43, of which $1,640 has been applied to maintenance.

It is estimated that 60 per cent of the project has been accomplished and has resulted in securing a channel of 4 feet at mean low water over the 9 miles between the mouth and Ostrander and in dredging two bars near Toledo in the upper stretch to a depth of 2½ feet at low water. The work has greatly facilitated the passage of boats to Ostrander, above which point sufficient work has not yet been done to affect the conditions.

The maximum draft that can be carried over the shoalest places at the close of the year is approximately 14 to 16 inches at low water.

The usual variations of the level of water surfaces, due to tide, range from 4 feet at the mouth to zero 9 miles up the stream. The extreme variation on account of freshets is about 22 feet, except at the mouth, where the country is open, allowing the water to spread over a large area.

The river has previously been improved to Toledo, about 40 miles. Under the present project a tidal section 9 miles in length from the mouth to Ostrander has been dredged to the projected depth of 4 feet at low water.

The head of navigation for light-draft boats on the higher stages is 10 miles above Toledo, or about 50 miles from the mouth. Large quantities of logs are annually floated down the river from the headwaters for a distance of 25 to 90 miles.

Kelso, 4½ miles from the mouth, and having a population of about 1,500 people, is the principal town of the valley, and is the center of a large lumber and shingle industry. Kelso and Castlerock, another small town about 20 miles from the mouth, are both on the main line of the Northern Pacific Railway, and while some lumber products are shipped by rail, the farm products are usually handled by the river boats and marketed at Portland. The river is therefore a great factor in regulating freight rates from these points to competing points on the river. The traffic consists of lumber, farm products, and general merchandise, of which 73,659 short tons were handled during the calendar year 1911, valued at $1,592,646.

Comparative statement of traffic.

Calendar years.	Short tons.	Estimated value.	Passengers.	Calendar years.	Short tons.	Estimated value.	Passengers.
1901	14,211			1907	66,424	$3,390,000	759
1902	15,932			1908	53,309	1,934,982	
1903	41,515			1909	41,063	1,641,240	14,100
1904	26,120	$1,069,020	6,875	1910	75,667	2,106,585	9,500
1905	46,646	1,494,260	6,000	1911	73,659	1,592,646	10,000
1906	56,109	2,055,460	1,117				

This statement does not include 109,980,812 feet b. m. (219,961 tons) of logs brought down this stream in 1911, having an estimated value of $714,870.

Of the amount recommended for expenditure during the fiscal year 1914, $7,500 is required to complete the project on account of the cost of repairs and alterations of the old United States dredge employed on the work, and of raising and repairing dredge after she had sunk. The balance, $6,000, is for maintaining the channel and removing obstructions which are brought down during freshet periods.

The river and harbor act of July 25, 1912, made provision for the construction of a combined dredge and snag boat, estimated to cost $55,000, which amount is provided by the act, for use in connection with the improvement of the Cowlitz, Lewis, and Clatskanie Rivers, in accordance with recommendation printed in House Document No. 28, Sixty-second Congress, first session.

July 1, 1911, balance unexpended		$24,485.89
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$14,953.25	
For maintenance of improvement	1,640.00	
		16,593.25
July 1, 1912, balance unexpended		7,892.64
July 1, 1912, outstanding liabilities		1,196.00
July 1, 1912, balance available		6,696.64
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		[1] 3,000.00
Amount available for fiscal year ending June 30, 1913		9,696.64

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[1] For statement of appropriation for dredge and snag boat, see p. 1228.

Amount (estimated) required to be appropriated for completion of existing project [1]$7,500.00

Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance (²)

(*b*) *Lewis River.*—The Lewis River rises in the Cascade Range, flows in a westerly direction, and empties into the Columbia River about 14 miles below the mouth of the Willamette and 26 miles below Portland. At a distance of about 3¾ miles from the mouth, the river separates into two branches, the North Fork, about 85 miles, and the East Fork about 36 miles in length.

Originally the channels were obstructed by snags, overhanging trees, and occasional shoals, but were navigable for small, light-draft boats at proper stages to La Center on the East Fork and Woodland on the North Fork.

Over the shoals the channels are narrow, but are of sufficient depth and capacity, at normal stages, to allow of daily steamboat service between Portland and Lewis River points. The improvement covers about 7 miles from the mouth to La Center on the East Fork, and about 26¾ miles of the North Fork to Hayes.

The original project was adopted by the river and harbor act of March 3, 1899, and is based on report of survey printed in the annual report of the Chief of Engineers for 1897, page 3473, and as House Document No. 64, Fifty-fifth Congress, first session, without maps. The estimated cost of the improvement, which did not include the North Fork, was $20,460. It provided for removal of snags and obstructions, dike construction and dredging with a view to securing a depth of 6 feet in the main river to the forks and 4 feet to La Center.

The present project is the same as the original one, except that the improvement of the North Fork was included in the river and harbor act of June 13, 1902, for which no estimate of cost had previously been made.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Mouth to Speliah Creek [1]	House	144	Fifty-second	Second	1893	[illegible]
La Center to the mouth [1]	do	831	Fifty-third	Third	1895	[illegible]
North Fork to Etna [1]	do	80	Fifty-fourth	Second	1897	[illegible]
Mouth to Runyon on North Fork and to La Center on East Fork.[1]	do	28	Sixty-second	First		

No modification has been made in the existing project since its adoption except its extension to include North Fork. The river and harbor act approved July 25, 1912, contains a provision for the construction of a combined dredge and snagboat, estimated to cost

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[1] Exclusive of amount available for fiscal year 1913.

[2] See consolidated money statement on page 1228.

[3] No maps.

$55,000, which amount is provided by the act, for use in connection with the improvement and maintenance of the Cowlitz, Lewis, and Clatskanie Rivers, in accordance with the report submitted in the document last referred to in above table.

During November, December, and January a small crew was engaged in removing 293 of the most dangerous snags from the channel between the mouth and Kinder Rock on the East Fork and as far as Hayes on the North Fork. The work accomplished rendered navigation easier and safer. The expenditures during the year amounted to $1,878.32, all of which was for maintenance of channel.

There has been expended on the original and modified project to the close of the fiscal year the sum of $27,705.34, of which approximately $5,453.72 has been applied to maintenance.

It may be stated that the original project has been entirely completed, and has resulted in facilitating to some extent the use of the river by steamboats. The maximum draft that can be carried at normal stages to the forks is about 4 feet, on the East Fork to La Center about 2½ feet, and on the North Fork to the head of navigation about 1 foot.

The variation of the water surfaces, due to tides, is from 2 feet at the mouth to 1½ feet at La Center, while at Woodland the tide has no effect. The winter freshets vary from 15 to 20 feet in height, except near the mouth, where the water spreads out over a large area, and the conditions are such that regular boats from Portland reach La Center during about three months of each year and Woodland about nine months.

The length of the improved sections and length in miles of the navigable portion are the same, viz:

		Miles.
Mouth to the forks	tidal	3¾
East Fork to La Center	do	3
North Fork to Woodland	do	3½
North Fork, Woodland to Runyon	nontidal	23

The head of navigation on the North Fork has heretofore been considered at Woodland, but at the present time a small boat is making daily trips to Runyon, about 23 miles above Woodland.

Logs are floated down this stream for a distance of 20 to 45 miles above the mouth.

The commerce consists principally of lumber, farm products, and general supplies, and during the calendar year 1911 amounted to 16,507 short tons, valued at approximately $1,092,290. This does not include large quantities of logs floated downstream.

Comparative statement of traffic.

Calendar years.	Short tons.	Estimated value.	Passengers.	Calendar years.	Short tons.	Estimated value.	Passengers.
1901	17,277		15,532	1907	20,140	$1,179,117	13,869
1902	13,831		13,098	1908	17,771	1,112,840	13,880
1903	29,068		13,058	1909	19,884	1,144,820	14,000
1904	27,245	$834,492	12,885	1910	51,865	1,352,145	6,450
1905	26,554	1,067,738	29,026	1911	16,507	1,092,290	8,499
1906	19,024	960,120	16,614				

NOTE.—This statement does not include 19,431,041 feet b. m. (38,862 tons) of logs brought down this stream in 1911, having an estimated value of $126,300.

Regarding the decline in tonnage carried on the Lewis River during the calendar year 1911, it is stated by the transportation agents that the actual amount of freight handled during 1911, in and out of the territory tributary to the river, did not materially differ from the preceding year, but owing to the uncertainty of river transportation on account of the condition of the channel, larger quantities of freight were diverted from the river and hauled by team at great expense to and from distant rail points; also that the shutting down of the logging camps and lumber mills along the river had a tendency to decrease the tonnage.

The Northern Pacific Railway, between Portland and Puget Sound, crosses the river at Woodland, but the river carries the greater part of the commerce from the valley, owing to the cheaper rates of transportation and the better facilities for handling traffic by water.

A large amount of sediment and numerous snags are brought down by the freshets, which necessitates additional work each year to maintain the channel and make it available for boats of light draft.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, is to be applied to operating the combined dredge and snagboat for improving the river in accordance with the new project adopted by the river and harbor act of July 25, 1912.

July 1, 1911, balance unexpended	$2,022.98
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	1,878.32
July 1, 1912, balance unexpended	144.66
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	2,500.00
Amount available for fiscal year ending June 30, 1913	2,644.66
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	([1])

CONSOLIDATED.

July 1, 1911, balance unexpended		$26,508.87
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$14,953.25	
For maintenance of improvement	3,518.32	
		18,471.57
July 1, 1912, balance unexpended		8,037.30
July 1, 1912, outstanding liabilities		1,196.00
July 1, 1912, balance available		6,841.30
Amount appropriated by river and harbor act approved July 25, 1912		5,500.00
Amount available for fiscal year ending June 30, 1913		12,341.30
Amounted (estimated) required to be appropriated for completion of existing project		[2]7,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[2]23,500.00

(See Appendix U U 7.)

DREDGE AND SNAG BOAT FOR COWLITZ, LEWIS, AND CLATSKANIE RIVERS, OREG. AND WASH.

Amount appropriated by river and harbor act approved July 25, 1912	$55,000.00
Amount available for fiscal year ending June 30, 1913	55,000.00

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[1] See consolidated money statement on this page.

[2] Exclusive of amount available for fiscal year 1913.

8. Grays River, Wash.—Grays River rises in the Coast Range, flows southwesterly for a distance of about 30 miles, and empties into that part of the estuary of the Columbia River known as Grays Bay, nearly opposite the town of Astoria. It passes through dense forests until it reaches the lowlands bordering the Columbia River. The lower 8 miles is covered by the improvement, and this portion has been navigated for years with difficulty, owing to the narrow, tortuous channel and to snags, logs, and overhanging trees.

The original and present project was adopted by the act of March 2, 1907, which appropriated $2,500 for the purpose of removing the obstructions from the channel and cutting the overhanging trees from the banks. The project for this work was based on a report of the Board of Engineers for Rivers and Harbors dated October 15, 1906, by which it was proposed to carry the improvement to the head of navigation. (See River and Harbor Committee Doc. No. 1, 59th Cong., 2d sess.; no maps.)

A report of an examination and survey is printed in the Annual Report of the Chief of Engineers for 1891, page 3385. (No maps.)

No modification has been made in the existing project.

Operations during the fiscal year have been confined to snagging by a small party with powder and use of launch. This work was done during October. A total of 180 snags were removed from the channel and 17 overhanging trees cut from the banks, with an expenditure of $551.60.

The total amount expended on this work to the close of the fiscal year 1912 was $2,952.27, of which amount $452.27 has been applied to maintenance.

The project has been completed, and except for maintenance no further work is contemplated.

The work done in former years, which consisted in the removal of snags and scraping some of the shoals, has provided a safer and easier channel and has rendered the river navigable at a stage of water at least 6 inches less than was possible prior to improvement.

The maximum draft that can be carried to Grays River, a small town 8 miles above the mouth, is about 3 feet at low water. The variation of water surfaces due to tides is from 5 to 8 feet.

The improved section, also the navigable portion of Grays River, is tidal and is 8 miles in length. It extends from the mouth to the town of Grays River, which is the head of tide and of navigation.

This stream is used extensively for logging purposes, logs being floated from the headwaters a distance of about 10 miles.

The commerce consists principally of logs towed from the lower portion of the stream to the mills along the Columbia and some farm products and supplies handled by a small boat plying from Astoria.

Comparative statement of traffic.

Calendar years.	Short tons.	Estimated value.	Passengers.
1908	1,876	$5,628	....
1909	3,395	51,325	5,000
1910	7,949	161,198	6,000
1911	2,465	68,589	6,000

NOTE.—This statement does not include 66,600,000 feet b. m. (133,200 tons) of logs brought down this stream in 1911, having an estimated value of $432,900.

The river is the only means of transportation, and, aside from furnishing easier navigation for the light-draft boats using the channel, it is not believed the improvement will have any tendency to reduce the present rates of transportation.

The winter freshets usually bring down snags and logs, and the available balance will be applied to the purpose of removing them as may be necessary.

The amount estimated as a profitable expenditure in fiscal year 1914 will be applied to the removal of obstructions, necessary to make the improvement available.

July 1, 1911, balance unexpended	$1,099.33
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	551.60
July 1, 1912, balance unexpended	547.73
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 500.00

(See Appendix U U 8.)

9. *Gauging waters of Columbia River.*—The object of this gauging is to obtain data for use in connection with the improvement of the river and to supply information to persons interested in its navigation.

A self-registering gauge was established at Astoria, Oreg., in 1888, and was kept in operation up to August, 1899, and then moved to Fort Stevens, Oreg., but was later abandoned.

During late years a river gauge established at the mouth of the Willamette River has been continuously read and the records kept.

The amount expended for establishing and keeping records of gauges to the end of the fiscal year 1912 was $11,151.75.

In March, 1911, staff gauges were established on the Columbia River at the following points: Willow Bar, Warrior Rock, Martins Bluff, Kalama, Slaughters Bar, Stella, Waterford, Cathlamet, and Elliott Point. One gauge was also established at the mouth of the Willamette River and one at Linnton.

These gauges were established for the purpose of determining the slope of the river and for use in measuring the volume of discharge.

Records of the above gauges were kept up to October, 1911, when the services of the readers were dispensed with except for the gauges at the mouth of the Willamette River and at Slaughters Bar. The reading of gauge at Slaughters Bar was dispensed with on November 30, 1911, but readings for gauge at mouth of Willamette River are still being recorded.

The office work in connection with plotting of the records of the gauges was completed in June, 1912, the necessary corrections determined, and the gauges reset accordingly.

With the expenditure of $1,000 included in the river and harbor act of July 25, 1912, it is believed that sufficient data will have been obtained to warrant the discontinuance of further appropriations under this heading. Such additional work of gauging and measuring tidal and river volumes as may be necessary can be carried on as an adjunct of the work of improving Columbia and lower Willamette Rivers by the men employed regularly on this improvement.

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[1] Exclusive of the balance unexpended July 1, 1912.

For this reason no estimate is submitted in the money statement for the fiscal year 1914, and it is recommended that no further funds be provided under the appropriation title "For gauging waters of Columbia River and measuring tidal and river volumes."

The amount expended during the year for establishing gauges and for reading, recording, and adjusting same, was $1,574.80.

July 1, 1911, balance unexpended	$2,423.05
June 30, 1912, amount expended during fiscal year for maintenance of improvement	1,574.80
July 1, 1912, balance unexpended	848.25
July 1, 1912, outstanding liabilities	147.50
July 1, 1912, balance available	700.75
Amount appropriated by river and harbor act, approved July 25, 1912	1,000.00
Amount available for fiscal year ending June 30, 1913	1,700.75

(See Appendix U U 9.)

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

The local officer was also charged with the duty of making a preliminary examination and survey, provided for in the river and harbor act of March 3, 1909, of the *Falls of Willamette at Oregon City, Oreg.*, and reports thereon will be duly submitted when received.

EXAMINATION AND SURVEY MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports, dated October 28, 1910, and May 17, 1911, with maps, on preliminary examination and survey, respectively, of *Willamette River, between Portland and Oregon City, Oreg.*, required by the river and harbor act approved June 25, 1910, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 438, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $24,000 for first construction, with $2,500 annually for maintenance, is presented.

IMPROVEMENT OF RIVERS AND HARBORS IN THE SEATTLE, WASH., DISTRICT.

This district was in the charge of Maj. C. W. Kutz, Corps of Engineers, until July 31, 1911, and Maj. J. B. Cavanaugh, Corps of Engineers, from August 1, 1911, having under their immediate orders Capt. Francis A. Pope, Corps of Engineers, until August 22, 1911, and Capt. Arthur Williams, Corps of Engineers, until April 13, 1912. Division Engineers: Col. John Biddle, Corps of Engineers, to July 19, 1911, and Lieut. Col. Thos. H. Rees, Corps of Engineers, from July 20, 1911.

1. Willapa River and Harbor, Wash.—Willapa Harbor connects with the Pacific Ocean in the extreme southwestern part of the State of Washington, about 30 miles north of the entrance to the Columbia River and 18 miles south of Grays Harbor, and is approximately 20 miles long from north to south and 10 miles wide from east to west.

Willapa River has its source about 30 miles east of Willapa Harbor, flows in a westerly direction, and empties into the harbor about 10 miles from the sea entrance.

The lower section of the river, about 14 miles in length, is covered by the existing project and extends to its mouth.

South Bend, near the mouth of the river, the terminus of a branch line of the Northern Pacific, and Raymond, about 3 miles above South Bend, are the principal towns in that locality. Willapa is a small town 10 miles above South Bend. North River is a stream flowing into the bay from the north, and Nasel River is an arm making off from the southeast part of the bay proper.

Originally shoals existed in the river below Willapa, and there was a log jam in North River.

The original project adopted by act of July 13, 1892, contemplated dredging 100 feet wide to a depth of 8 feet at low water through the reef just below Willapa and the closing of side sloughs near South Bend by means of dikes, with the object of increasing channel depths by scour. This project was modified by act of March 2, 1907, which provided for dredging a channel 150 feet wide and 12 feet deep at mean lower low water through the shoals between South Bend and Raymond at an estimated cost of $25,000. The amount expended under the original project and the modified project adopted by the act of March 2, 1907, was $61,114.46.

Under acts of August 18, 1894, and March 3, 1899, removal of the log jam in North River was authorized.

The project adopted by the river and harbor act of June 25, 1910, is in accordance with plan printed in House Document No. 524, Sixty-first Congress, second session, and contemplates providing a channel 200 feet wide and 18 feet deep at mean lower low water from deep water in Willapa Bay to the junction of the North and South Forks of the river at Raymond, and of the same depth and 150 feet in width for a distance of 3,100 feet up the South Fork, conditioned upon local cooperation in the work in the South Fork, at an estimated cost of $218,132.20, with $5,000 annually for maintenance.

The existing project is that adopted by the act of June 25, 1910, and there has been no modification of this project.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Willapa River [1]					1885	[illegible]
North River [2]					1891	[illegible]
Willapa River and Harbor from entrance to 10 miles above South Bend.[2]					1891	[illegible]
North River [1]					1896	[illegible]
Do.[1]	House	91	Fifty-fourth	Second	1897	3472
Willapa River, mouth of, and Mailboat Slough.	do	[2] 100	Fifty-fifth	do	1898	[illegible]
Willapa River, South Bend to Raymond.[2]	do	477	Fifty-ninth	First		
Willapa River and Harbor, to and through Raymond.[2]	do	524	Sixty-first	Second		

[1] No maps.

[2] Contains maps.

The project for increased depth of 18 feet was adopted by the act of June 25, 1910, upon condition that one-half the cost of certain work at Raymond should be paid by local interests and that the necessary bulkheads should be built and sites furnished free of cost to the United States for the deposit of material to be dredged from the channel in the vicinity of both Raymond and South Bend.

The conditions relative to local cooperation have been complied with, and contract made for the whole work covered by the project, under the continuing-contract authorization provided by the river and harbor act of February 27, 1911, for completion of the project under which $43,132 is yet to be appropriated.

During the year the channel in the South Fork was completed except removal of the rock reef near South Bend. The total length of channel excavated was 11,300 feet.

The amount expended during the year was $45,002.05, none of which was for maintenance.

The amount expended on original and the existing projects to close of fiscal year ending June 30, 1912, was $106,534.25, of which $4,613.02 was applied to the maintenance of dikes and for inspection of obstructions to navigation. The sum of $38.30 was received from sales.

Approximately 30 per cent of the work covered by the existing project had been accomplished on June 30, 1912.

The present available depth of water over the bar at the entrance to the harbor is 26½ feet at mean lower low water.

The maximum draft that can be carried June 30, 1912, over the shoalest part of the channel below South Bend is 16 feet at mean lower low water, to be increased to 18 feet at mean lower low water before the end of the next fiscal year by work now in progress.

The controlling channel depths between South Bend and Raymond are 18 feet, and between Raymond and Willapa 6 feet, at mean lower low water.

The extreme variation of water levels is 14 feet, and the mean variation is 9 feet.

The North and Nasel Rivers are navigable only for small boats of light draft for a camparatively short distance above their mouths, and this distance is extremely variable with the tides. The principal business on these rivers is the rafting and floating of logs. The log and lumber business on Willapa Bay and tributary streams is by far the most important part of the water traffic.

Exports and imports.

Calendar year.	Short tons.	Value.	Calendar year.	Short tons.	Value.
1898	32,399	$374,050	1905	76,713	$456,213
1899	51,150	755,682	1906	116,717	1,220,434
1900	42,090	266,080	1907	183,801	1,847,810
1901	39.538	229,696	1908	214,812	2,847,253
1902	51,999	402,050	1909 [1]	433,518	3,109,173
1903	74,475	446,800	1910	486,516	4,190,410
1904	73,808	389,377	1911	743,681	4,597,654

[1] Value published in 1910 report incorrect, due to clerical error.

The direct effect on freight rates of the work done is not known definitely.

The appropriation recommended will be applied toward completion of the project adopted by the act of June 25, 1910, and is necessary to make the improvement available.

July 1, 1911, balance unexpended	$99,836.20
Received from sales	20.20
	99,856.40
June 30, 1912, amount expended during fiscal year, for works of improvement	45,002.05
July 1, 1912, balance unexpended	54,854.35
July 1, 1912, outstanding liabilities	463.01
July 1, 1912, balance available	54,391.34
Amount appropriated by sundry civil act approved Aug. 24, 1912	75,000.00
Amount available for fiscal year ending June 30, 1913	129,391.34
July 1, 1912, amount covered by uncompleted contracts	117,436.43
Amount of continuing contract authorization, act of Feb. 27, 1911	118,132.20
Amount appropriated under such authorization	75,000.00
Amount yet to be appropriated	43,132.20
Amount (estimated) required to be appropriated for completion of existing project	[1] 43,132.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 43,132.00

(See Appendix V V 1.)

2. *Grays Harbor and bar entrance, Wash.*—Grays Harbor is a large bay in the southwestern part of the State of Washington connecting with the Pacific Ocean. It is 48 miles north of the mouth of the Columbia River and it has a total length from east to west of 17 miles, and its greatest breadth north and south is 14 miles.

A large part of the bay is occupied by tide flats, bare at low water. At low tide the area covered by water is estimated at 30.6 square miles, or less than one-third of the total area.

A short distance within the harbor entrance are large areas affording anchorage for deep-draft vessels.

The harbor entrance is between two low sandy peninsulas, which are about 12,500 feet apart, measured between high-tide lines.

Through this entrance there is a channel having a maximum depth of 100 feet or more. A single broad waterway extends for more than 2 miles out to sea from the entrance, with depths gradually diminishing to 30 feet. At the outer end of this deep waterway lies a bar convex to the sea and extending each way to the sand spits on the two sides of the harbor throat.

Across the bar there was originally no good permanent channel, but there were several variable, shifting channels having depths of about 12 or 13 feet. The general average width of the bar between the inner and outer 18-foot curves was one-half mile.

The original project, adopted by Congress June 3, 1896, provided for the control of tidal currents by means of a single jetty extending out to sea from the point on the south side of the harbor throat a distance of about 3½ miles, with a view to improving and maintaining the channel over the bar by scour. The jetty was to be of rubblestone, built above high-tide level. This project contemplated a depth of 24 feet at mean low water.

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[1] Exclusive of amount available for fiscal year 1913.

The estimated cost was $1,000,000. The act making the first appropriation for this work authorized the making of a continuing contract or contracts. In accordance with this authority a contract for the entire work was entered into after due advertisement. Work under this contract was commenced in March, 1898, and terminated September 15, 1902. The jetty was constructed for a distance of 13,734 feet from the ocean high-water line. No construction work on the south jetty has been done since.

The amount expended on the original project was $1,003,261.67.

The project was enlarged by the river and harbor act of March 2, 1907, which provided for the construction of a jetty on the north side of the harbor throat, extending out to sea about 9,000 feet from the ocean high-water line, at an estimated cost of $600,000. The act appropriated $200,000 and authorized continuing contracts for completing the project in the additional sum of $400,000, which amount has been appropriated.

The river and harbor act of June 25, 1910, further extended the project by providing for the extension of the north jetty 7,000 feet, thus bringing the end of the jetty about opposite the present end of the south jetty, to be built up to the height of midtide, with a width at the crest of 8 feet, at an estimated cost of $1,030,000, in accordance with plan printed in Rivers and Harbors Committee Document No. 29, Sixty-first Congress, second session, the said act making an appropriation of $75,000 for continuing the improvement authorized.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Grays Harbor, bar entrance [1]	Senate	112	Forty-seventh	First	1895	3517
Do.[2]	House	576	Fifty-eighth	Second	1904	3585
Do.[2]	do.[3]	29	Sixty-first	do		

[1] Contains maps. [2] No maps. [3] Committee document.

The existing project is an enlargement of the original project for construction of a jetty on the south side of the entrance to Grays Harbor, to secure by scour a depth of 24 feet at mean low water across the bar at the entrance to the harbor.

This project was enlarged to provide for a jetty 9,000 feet long on the north side of the harbor entrance, and further enlarged to provide for an extension of the north side jetty 7,000 feet to bring the end of this jetty about opposite the present end of the south jetty.

The work on the north jetty has been in progress since October 1, 1907. The necessary land for approach and operating plant was donated to the United States by local interests. The trestle approach to the jetty and the wharf and other features of the shore works were built under contract, the work commencing on October 24, 1907, and being completed March 31, 1908.

The contract for stone entered into on March 28, 1908, was in force during the working season of 1910, and was terminated by agreement on January 16, 1911. Under this contract 52,423.58 tons of stone were received during the year.

Under contract authorization of the act of February 27, 1911, a contract was made for furnishing 375,000 tons of stone, and deliveries commenced on June 16, 1911.

During the fiscal year 163,608 tons of stone were received and placed in the jetty, 2,752 feet of trestle built, and mattress foundation laid for a distance of 2,880 feet.

At the close of the year the jetty trestle and mattress foundation had been built for a distance of 15,536 feet and the enrockment brought to midtide elevation for a distance of 10,832 feet from the ocean high-water line.

Considerable damage was done to the jetty trestle by storms during the past winter; 56 complete bents and 117 single piles were carried out, and these with 122 additional piles were replaced during the present working season.

A survey of the bar was practically completed at the close of the year, and the results indicate that the outer bar has apparently shoaled, quite generally, and the deep water between the outer ends of the jetties shows a tendency to shift to the northwest and develop a channel to the north of the present one.

The channel past the end of the north jetty is still well defined, and it is believed that further extension of the north jetty beyond the limits of the present project will be required before the channel can be fixed in position to the southward and the project depth of 24 feet secured.

The amount expended during the year was $301,974.33, of which $354.16 was for surveys.

The amount expended to June 30, 1912, was $1,979,717.28, of which $11,599.37 was for maintenance and surveys. The sum of $87.25 was received from sales.

The act of February 27, 1911, authorized continuing contracts for completion of the project in the sum of $655,000, which amount is appropriated in the sundry civil act approved August 24, 1912.

On June 30, 1912, there has been accomplished approximately 75 per cent of the whole project (north and south jetties); 60 per cent of the north jetty and 30 per cent of the extension of the north jetty authorized by the act of June 25, 1910.

The maximum draft that could be carried June 30, 1912, at mean lower low water over the shoalest part of the channel was 18 feet.

The extreme variation of water levels in the outer portion of the harbor is 16.5 feet, while the mean variation is 8.4 feet.

The commerce benefited by the work consists at present principally of exportation of lumber, carried in sail and steam vessels. This is a large and important business.

Exports and imports.

Calendar year.	Short tons.	Value.	Calendar year.	Short tons.	Value.
1898	168,468	$1,252,089	1905	579,759	$5,552,166
1899	265,918	1,979,998	1906	614,854	7,735,954
1900	259,692	2,077,087	1907	747,725	8,862,667
1901	299,607	1,877,800	1908	827,154	7,421,811
1902	527,047	3,601,163	1909 [1]	527,220	4,802,383
1903	458,268	4,073,338	1910	671,836	6,016,752
1904	495,495	4,200,784	1911	710,840	6,092,896

[1] Differs from amounts published in report of 1910 by omission of log traffic that does not pass over the bar.

So far as known the improvement has not caused any reduction in freight rates.

July 1, 1911, balance unexpended		$327,340.15
Received from sales		4.15
		327,344.30
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$301,620.17	
For maintenance of improvement	354.16	
		301,974.33
July 1, 1912, balance unexpended		25,369.97
July 1, 1912, outstanding liabilities		12,444.23
July 1, 1912, balance available		12,925.74
Amount apropriated by sundry civil act approved Aug. 24, 1912		655,000.00
Amount available for fiscal year ending June 30, 1913		667,925.74
July 1, 1912, amount covered by uncompleted contracts		433,443.18
Amount of continuing contract authorization, act of Feb. 27, 1911		655,000.00
Amount appropriated under such authorization		655,000.00

(See Appendix V V 2.)

3. Grays Harbor (inner portion) between Aberdeen and the entrance to said harbor, and Chehalis River, Wash.—Grays Harbor is situated in the southwest part of the State of Washington, 48 miles north of the mouth of the Columbia River. It has a total length from east to west of 17 miles and its greatest breadth from north to south is 14 miles. There are two main channels traversing the inner or eastern part of Grays Harbor from east to west—the north and south channels. There was also formerly a middle channel connecting the north and south channels. The south channel is shoal and is but little used. The north channel is used by all ocean-going vessels entering the harbor. There are two shoals in the north channel, one about 2½ miles below Hoquiam and one between Hoquiam and Aberdeen. The ruling depth over these shoals was originally 8 feet at mean low water. The channel widths were ample.

The Chehalis River has its source in the southwestern part of the State of Washington about 110 miles east of the Pacific Ocean, flows in a westerly course for 93 miles and empties into the eastern extremity of Grays Harbor.

The section covered by the existing project is about 15 miles in length and includes the mouth of the river.

From the mouth to Montesano, 15 miles, there is about 13 feet of water at high tide. From Montesano to Elma, 16 miles, there is generally sufficient water for light-draft boats. There is practically no navigation above Elma and no regular boats go above Montesano. The river is used extensively for floating saw logs.

The original project for the inner harbor, adopted by Congress July 13, 1892, provided for the construction of piles, brush and stone dikes to partly close up the south and middle channels and concentrate the flow of water in the north channel, thereby increasing the depth of water by scour. The shoals above and below Hoquiam were to be dredged to a depth of 16 feet at half tide.

The amount expended prior to operations under existing project was $93,999.06.

The original project for Chehalis River, adopted by Congress August 2, 1882, contemplated the removal of snags and other obstructions which may accumulate in the portion of the river regularly used by boats. The estimated cost was $50,000. The amount expended on the original project was $19,000.

The existing project, adopted by the river and harbor act of March 2, 1907, provides for a channel 200 feet wide and 18 feet deep at mean lower low water from Cosmopolis to deep water below Hoquiam, and removing snags from the Chehalis River, at an estimated cost of $187,500, in accordance with House Document No. 507, Fifty-ninth Congress, first session.

The funds provided by this act were insufficient to secure the project channel dimensions, but these dimensions were obtained with funds provided by the act of March 3, 1909, and use of the Government dredge *Oregon*.

Subsequently a shoal formed in the channel below Hoquiam over which the depth was 13 feet at mean lower low water. This shoal was removed in 1911, but at the close of the fiscal year the channel below Hoquiam had again shoaled to 16 feet and near Aberdeen to 13 feet at mean lower low water.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Chehalis River [1]					1875	[illegible]
Do.[1]					1882	[illegible]
Inner harbor and Chehalis River					[illegible]	[illegible]
Do.[1]	House	507	Fifty-ninth	First		
Chehalis River [2]	do	1127	Sixtieth	Second		

[1] No maps.

[2] Contains maps.

There has been no modification of the existing project.

During October and November, 1911, 94,350 cubic yards of material were dredged from the channel below Hoquiam, under emergency contract.

The amount expended during the fiscal year was $15,979.64, all for maintenance.

To June 30, 1912, $310,746.64 had been expended under the above projects, of which $43,584.52 was applied to maintenance and for surveys. The sum of $30.05 was received from sales.

To provide for maintenance of project channel depths by dredging, the sum of $30,000 will be required for the fiscal year ending June 30, 1914.

The project for the Chehalis River, adopted by the river and harbor act of June 25, 1910, contemplates providing a channel 6 feet deep at low water from Cosmopolis to Montesano and the construction of dikes to concentrate the current over certain shoals, in accordance with plan printed in House Document No. 1125, Sixtieth Congress, second session. The estimated cost of the proposed work is $50,000, the said act making an appropriation of $32,500, and $10,000 additional was appropriated by the act of February 27, 1911. There has been no modification of the existing project.

The channel between Cosmopolis and Montesano was dredged to project dimensions by the Government dredge *Oregon* during 1910, but the channel depths have deteriorated and the controlling depth is now 4 feet at mean lower low water.

No work was done on the Chehalis River during the year.

The maximum draft that could be carried June 30, 1912, over the shoals below Aberdeen at mean lower low water was 13 feet.

The maximum draft that could be carried June 30, 1912, at mean low water at Montesano was about 4 feet.

The tidal variation is 8½ feet in the inner harbor and 7 feet in the Chehalis River.

The commerce benefited by this improvement consists very largely of floating and towing logs and carrying lumber in sailing vessels and steam schooners.

Exports and imports.

Calendar year.	Short tons.	Value.	Calendar year.	Short tons.	Value.
1898	2,780	$293,610	1905 [1]	730,108	$3,920,080
1899	2,232	352,316	1906 [1]	842,423	5,354,891
1900	4,376	132,157	1907 [1]	882,914	7,079,161
1901	5,706	200,264	1908 [1]	862,809	6,249,424
1902	3,529	157,532	1909 [1]	666,061	6,619,052
1903	4,972	139,150	1910	784,772	4,692,530
1904 [1]	548,575	2,601,623	1911	1,283,086	4,967,797

[1] Differs from former reports due to addition of log traffic.

No definite information of reduction of freight rates on account of the improvement has been received.

The funds recommended for appropriation will be applied to restoration of channel depths necessary to make the improvement available.

July 1, 1911, balance unexpended	$29,763.99
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	15,979.64
July 1, 1912, balance unexpended	13,784.35
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 30,000.00

(See Appendix V V 3.)

4. *Hoquiam River, Wash.*—The Hoquiam River rises in the high plateau west of Puget Sound and flows southward for a distance of 12 miles to Grays Harbor, into which it empties at the city of Hoquiam. The main river is joined by two smaller streams, the Little Hoquiam and East Branch, about 2 miles from its mouth.

The section of the river included in the original and existing project is from its mouth to the junction of the two small streams above mentioned. Throughout this section the depth is approximately 20 feet at mean lower low water, except at four localities where the depths vary from 11 feet to 16 feet at mean lower low water, and the channel widths are contracted.

The original project of March 22, 1911, adopted by the act of July 25, 1912, contemplates excavation through four shoals in the lower section of the Hoquiam to provide a channel 100 feet wide and 18 feet deep at mean lower low water, at an estimated cost (in round numbers) of $12,000, and is adopted subject to the condition that no expenditures shall be made until a suitable dumping ground is furnished free of cost to the United States, the work to be done when a Government dredge can be used for the purpose without prejudice to works of greater importance or the extra cost of the work by other dredges shall have been provided for by local interests.

The report, with map, on examination and survey upon which the project is based was published in House Document No. 268, Sixty-second Congress, second session.

There has been no modification of this project.

This is a new work, and there were no operations nor expenditures during the fiscal year.

The head of navigation for steam vessels is at the junction of the Little Hoquiam River and the East Branch. Logs are floated on the main river and its branches during freshet seasons and by means of splash dams for distances varying from 2 to 6 miles.

The tidal variation to the head of navigation is 9 feet.

The commerce consists of the floating and towage of saw logs on the upper part of the Hoquiam River and tributaries and the shipment of lumber products from mills situated in the city of Hoquiam.

During the calendar year 1909 the commerce on the Hoquiam River was valued at $3,486,703.

During the calendar year 1911, 75,000,000 feet, board measure, of logs were rafted and towed from the boom works on this river.

No direct effect upon freight rates is expected from the improvement, but provision will be made for the use of a larger class of vessels in the export of lumber products.

The amount carried in the river and harbor act of July 25, 1912, is sufficient to complete the work covered by the project.

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[1] Exclusive of the balance unexpended July 1, 1912.

Amount appropriated by river and harbor act approved July 25, 1912	$12,000.00
Amount available for fiscal year ending June 30, 1913	12,000.00

(See Appendix V V 4.)

5. Puget Sound and its tributary waters, Wash.—Most of the channels of Puget Sound proper have ample depths for purposes of navigation, but the extensive lumber and fishing industries in these waters render it very important to maintain a general supervision over the navigable channels, to regulate the construction of fish traps, log booms, and other structures incident to these important industries, and to prevent obstructions which are detrimental to general navigation. A number of streams and rivers tributary to Puget Sound are of great value to boat navigation, but they are all liable to be obstructed by the débris generally found in streams flowing through a heavily wooded country.

All these streams are used to a greater or less extent for floating logs and shingle bolts, and the towing of log rafts and timber products constitutes the main part of the commerce. The distance upstream to which boats run is extremely variable, depending on the stage of water and tide. Steamboat navigation on the Skagit extends as far up as the mouth of the Sauk, but boats do not often ascend above Hamilton or Birdsview.

On the Stilaguamish boats do not go above Florence, 6 miles from the mouth. The Snohomish is navigable for river boats to the Forks, 22 miles, and the lower portion of one of its tributaries, the Skykomish, is navigable at high stages. The Snoqualmie River is navigable at a low-water stage for a distance of 30 miles from the Forks, and at high stages for an additional distance of 20 miles. On the Duwamish small boats go as far as the junction of the White and Black Rivers, about 16 miles from the mouth. Under favorable conditions they can go several miles up the White, and occasionally boats pass up the Black into Lake Washington. On all these streams the distances to which steamboat navigation actually extends are generally less, and the distances over which towing and floating of logs extend are greater than the distances above named. None of these streams is closed in winter by ice. All are affected by the tidal variation in Puget Sound, which is large and extremely irregular.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Nooksak River [1]					1881	2611
Do.[1]					1891	3271
Do	House	[2] 276	Fifty-third	Third	1895	3511
Do.[1]	do	414	Sixty-first	Second		
Stilaguamish River [1]					1881	2608
Do.[1]	House	19	Sixty-second	First		
Duwamish River [1]					1884	2296
Do.[1]	House	27	Fifty-first	Second	1891	3258
Do	do	[2] 395	Fifty-fifth	do	1898	3108
Do.[1]	do	590	Fifty-ninth	First		

[1] No maps.

[2] Contains maps.

The work of improvement consists in the maintenance of the navigable channels by snagging and removing obstructions.

Formerly works of improvement were carried on under specific appropriations, but since the act of July 13, 1892, appropriations have been made in the present general and comprehensive form except in cases of large local works. This method operates greatly to the advantage and economy of the work.

There is a considerable amount of miscellaneous work in the district that is paid from this appropriation, such as investigation of harbor lines, bridges, obstructions, occasional surveys, gauge readings, etc.

The snag boat was in commission during the entire year, except for 20 days, when repairs were being made.

Snagging operations were carried on in the rivers tributary to Puget Sound and dredging was done to restore channel depths in these rivers.

The amount expended during the year was $19,982.29, for maintenance.

The amount expended to June 30, 1912, was $406,560.72, of which $13,619.36 was expended in construction and repair of dikes and mattress sills.

The act of March 2, 1907, provided for the removal of the rock in the entrance to Roche Harbor at a cost not to exceed $30,000. The work was begun October 1, 1907, under contract, and completed April 17, 1908.

The water traffic on Puget Sound and its tributary waters is very large and rapidly growing. It includes vessels of about every type and size in use throughout the world, but it is quite impracticable to give in the form of concise statistics a condensed statement of the amount and value of the commerce more or less directly benefited by work under this appropriation. Statistics have been compiled only for the tributary streams on which the snag boat has mostly worked.

Exports and imports.

Calendar year.	Short tons.	Value.	Calendar year.	Short tons.	Value.
1898	12,676	$539,406	1905	86,412	$1,817,068
1899	13,500	577,586	1906	167,197	1,898,057
1900	35,066	1,324,926	1907	124,336	3,011,146
1901	30,155	1,499,420	1908	44,922	1,659,930
1902	61,794	2,324,980	1909	143,770	1,250,684
1901	94,274	3,193,456	1910	183,447	1,417,700
1904	92,465	1,790,823			

No definite information relative to effect of the work on freight rates is available.

The appropriation recommended will be applied to the operation of the Government plant in the maintenance of navigable channels and the removal of obstructions to navigation.

The river and harbor act of July 25, 1912, made an appropriation of $25,000 for continuing improvement and for maintenance, including Stilaguamish River, in accordance with report printed in House Document No. 19, Sixty-second Congress, first session, which contemplates restoring and maintaining former widths and depths in the main channel and in the other two outlets, South Pass and West Pass; the effect of the closure of Hat Slough to be observed for some time before other measures to bring about the desired results are undertaken.

July 1, 1911, balance unexpended	$102,853.37
Received from sales	13.65
	102,867.02
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	19,982.29
July 1, 1912, balance unexpended	82,884.73
July 1, 1912, outstanding liabilities	922.79
July 1, 1912, balance available	[1] 81,961.94
Amount appropriated by river and harbor act approved July 25, 1912	25,000.00
Amount available for fiscal year ending June 30, 1913	106,961.94
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[2] 25,000.00

(See Appendix V V 5.)

6. *Harbor of Olympia, Wash.*—Olympia is situated at the extreme southern point of Puget Sound at the head of Budd Inlet. The upper end of this inlet is shoal. Shoal water extends northward from the Fourth Street Bridge for a distance of 8,750 feet to a depth of 12 feet at mean lower low water in Budd Inlet. Originally nothing but shallow-draft boats could reach the wharves near Fourth Street Bridge, and those only at high tide.

The original project, adopted by Congress by act of July 13, 1892, contemplates dredging a channel on the east side of the harbor 250 feet wide and 12 feet deep at the mean of the lower low waters from the vicinity of the Fourth Street Bridge to deep water in Budd Inlet, with a turning basin 500 feet wide at the lower end. The estimated cost was $147,000.

The river and harbor act of June 25, 1910, modified and extended this project in accordance with plan printed in Rivers and Harbors Committee Document No. 5, Sixty-first Congress, second session, which contemplates obtaining a channel 12 feet deep at mean lower low water and 200 feet wide on the west side of the harbor, with a turning basin at its inner end 800 feet long and 400 feet wide, at a cost of $58,000, with $1,160 annually for maintenance, subject to certain conditions as to cooperation on the part of local interests, as recommended in the said document, the act making an appropriation of $15,000. The balance, $43,000, was appropriated by the river and harbor act of February 27, 1911.

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[1] Of this amount, $75,000 is to be applied to the construction of a new snag boat.
[2] Exclusive of amount available for fiscal year 1913.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Olympia Harbor [1]					1885	2415
Do	House	[2] 32	Fifty-second	First	1892	2734
Deschutes River	do	[2] 104	Fifty-fifth	Second	1898	3094
Olympia Harbor [1]	do	405	Fifty-ninth	First		
Do.[1]	do	[2] 5	Sixty-first	Second		

The existing project provides for a channel on the east side of the harbor 250 feet wide and 12 feet deep at mean lower low water, from deep water in Budd Inlet to the vicinity of the Fourth Street Bridge, with a turning basin 500 feet wide at the inner end. The project has been enlarged to provide a channel on the west side of the harbor 12 feet deep at mean lower low water and 200 feet wide from deep water to a point 1,900 feet south of the West Side Waterway, with a basin at its southern end 800 feet long and 400 feet wide.

The channel and basin on the west side of the harbor were practically completed during the year, but 5 per cent of the work remaining to be done on June 30, 1912.

During the year 150,936 cubic yards of material were removed.

The amount expended during the year was $7,535.05, none of which was for maintenance.

The amount expended to June 30, 1912, was $168,977.18, of which $1,066.86 was for maintenance. The sum of 30 cents was received from sales.

On June 30, 1911, the maximum draft that could be carried through the channel and basin on the east side at low water was 12 feet and on the west side 13 feet. The maximum tidal variation is about 20 feet.

The commerce of the harbor is of general character and is carried on by ocean-going sailing vessels engaged in the lumber trade and by a variety of the smaller classes of boats plying between the ports of Puget Sound. Use of the dredged channel is limited to boats of relatively light draft, while sailing vessels carrying lumber now reach wharves near the entrance to the dredged channel at high tide and lie in a dredged basin while loading.

Exports and imports.

Calendar year	Short tons.	Value.	Calendar year.	Short tons.	Value.
1898	52,335	$1,208,226	1905	62,804	$2,069,289
1899	42,694	1,173,684	1906	82,024	2,363,493
1900	35,466	848,708	1907 [4]	244,171	3,855,518
1901	44,559	951,485	1908 [4]	188,140	3,120,602
1902 [3]			1909	116,195½	1,611,287
1903	40,333	841,635	1910 [5]	31,063	212,146
1904	20,152	856,450	1911 [5]	48,275	259,973

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[1] No maps.
[2] Committee document.
[3] Not obtainable.
[4] Differs from former reports, due to addition of log traffic.
[5] Incomplete.

No definite information as to the effect on freight rates of the work done is available.

July 1, 1911, balance unexpended	$43,557.87
Received from sales	.30
	43,558.17
June 30, 1912, amount expended during fiscal year, for works of improvement	7,535.05
July 1, 1912, balance unexpended	36,023.12
July 1, 1912, outstanding liabilities	220.00
July 1, 1912, balance available	35,803.12
July 1, 1912, amount covered by uncompleted contracts	23,914.15

(See Appendix V V 6.)

7. *Hammersly Inlet, Puget Sound, Wash.*—The mouth of this inlet lies about 10 miles north of Olympia. From its mouth to Shelton, a distance of 7 miles, the inlet is narrow and has sufficient depth for commercial purposes, except at three localities, where the depths at extreme low tide are from 4½ feet to 6 feet. The extreme tidal range is 22 feet.

A report of an examination and survey of Hammersly Inlet, with map, made in compliance with the provisions of the river and harbor act of March 3, 1909, was published in House Document No. 213, Sixty-first Congress, second session.

The original and existing project of October 22, 1909, adopted by the river and harbor act of June 25, 1910, is in accordance with plan printed in House Document No. 213, Sixty-first Congress, second session, and contemplates removal of material at three places—near the entrance, at Cape Horn Bar, and at No. 3 bar—to provide a channel 9 feet deep at extreme low water and 150 feet wide, at an estimated cost of $9,000, all of which has been appropriated.

There has been no modification of the existing project.

The project channel dimensions were secured by excavation of 17,940 cubic yards of material.

The amount expended during the year was $8,585.40, none of which was for maintenance.

The amount expended to June 30, 1912, was $9,000, all for improvement.

The only part of this inlet used as a commercial waterway is the stretch between its mouth and Shelton, but the inlet is navigable in part for a distance of 10 miles above Shelton.

Exports and imports.

Calendar year.	Short tons.	Value
1906	255,765	$2,307,124
1907	204,232	2,111,929
1908	210,812	1,849,614
1909	236,246	2,033,201
1910	194,689	1,958,478
1911	189,388	1,153,256

It is not expected that the proposed improvement will appreciably affect freight rates, but the delays caused by waiting for high tide will be avoided.

July 1, 1911, balance unexpended	$8,585.40
June 30, 1912, amount expended during fiscal year, for works of improvement	8,585.40

(See Appendix V V 7.)

8. Tacoma Harbor, Wash.—At the southern end of the harbor are extensive tide flats, which are bare at low water. Outside of these tide flats the depth increases very rapidly up to depths of 200 feet or more, reaching depths as great as 600 feet at the mouth of the bay, about 3 miles distant from the low-water line at its southern end. The principal water front of Tacoma is along the southwestern shore of the bay. Harbor lines have been established around the south end of the bay and along its western side. In order to facilitate commerce several waterways extending into the flats or tidelands have been laid out. One of these is known as the city, or west, waterway. The harbor of Tacoma may be considered to embrace all of Commencement Bay, including the waterways mentioned.

The extreme tidal variation is about 18 feet; mean variations, 14.5 feet.

The original and existing project for improvement of the city waterway, adopted by Congress by the act of June 13, 1902, contemplates dredging in the city waterway from deep water in Commencement Bay to Eleventh Street to a depth of 25 feet, from Eleventh Street to Fourteenth Street to a depth of 18 feet, and from Fourteenth Street to the south end of the waterway to a depth of 15 feet at extreme low water. The dredging was done under a continuing contract. There has been no modification of this project.

The amount expended to June 30, 1912, for improvement of the city waterway was $162,479.54, of which $12,460.96 was for maintenance, inspections, and surveys. The sum of 40 cents was received from sales.

The city waterway was completed according to the project, but deterioration, due to sluicing operations and sewer deposits, has taken place at the upper end. With this exception the prescribed depths could be carried for the whole length and width of the waterway on June 30, 1911.

The act of March 3, 1905, provided for improvement of the Puyallup waterway by dredging a channel 500 feet in width and 3,650 feet in length from its northern end and to a depth of 28 feet at extreme low water, in accordance with the report submitted in House Document No. 520, Fifty-eighth Congress, second session, at an estimated cost of $240,000. The same act appropriated $40,000 and authorized continuing contracts for completing the project in the sum of $200,000, which has been appropriated. The act required that certain portions of the necessary work should be done without expense to the United States, and that provision for permanent maintenance of the project without expense to the Government should be made.

There has been no modification of the existing project, except as stated hereafter in regard to suspension of operations.

The conditions named in the said act were complied with, and a contract was let for the work October 3, 1907.

The total quantity of material excavated and placed in fill under this contract was 1,811,599 cubic yards.

The amount expended to June 30, 1912, for improvement of Puyallup waterway was $159,584.86 and $14.27 for examinations.

In November, 1909, when more than one-half of the work in Puyallup waterway had been completed, several violent freshets occurred, as a result of which large quantities of material were brought down and deposited within the improved area, practically obliterating the work done by the United States. A series of soundings, taken December 1, 1909, showed that the deterioration from natural causes exceeded 1,000,000 cubic yards. A certain amount of filling had been taking place ever since the work was begun, but the great bulk of it occurred during the month of November, 1909. These circumstances and the possibility of their recurrence have thrown serious doubt upon the practicability of completing the project, while even if completed the cost of maintenance would be so excessive that it does not seem probable that the city of Tacoma would be able to carry out its agreement to maintain this project. It is certain that the channel would be seriously impaired by every freshet, as the dredged channel, of easy slope, acts as a catch basin for the vast quantities of material eroded and brought down by the rapid currents above.

These adverse conditions were not foreseen at the time of the adoption of this project, as they are largely due to the fact that, owing to a severe flood in November, 1906, the White River was turned bodily into the Puyallup River at a point near Sumner. The White River being considerably the larger of the two streams, the Puyallup was thus required to carry more than double its former normal flow; and as both rivers are heavy silt carriers, the effect of this change was highly detrimental to the work in Puyallup waterway.

In view of the above, the existing contract was terminated on April 26, 1910, the contract expiring by limitation on that date.

The action was subsequently sanctioned by Congress in the river and harbor act of June 25, 1910, which also directed the suspension of further work under the project until local interests shall divert the Puyallup River so it no longer empties into the Puyallup waterway, or otherwise prevent deposits therein from said river, as recommended in a report by the Board of Engineers for Rivers and Harbors, printed in Senate Document No. 418, Sixty-first Congress, second session.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Puyallup River [1]					1876	641
Do.[1]					1885	2417
Do.[1]	House	21	Fifty-first	Second	1891	3255
Do.[1]	do	345	Fifty-fifth	do	1898	3098
Tacoma Harbor	do	[2] 76	Fifty-sixth	do	1901	3598
Puyallup Waterway	do	[2] 520	Fifty-eighth	do	1904	3629
Puyallup River [2]	do	1107	Sixtieth	do		
Tacoma Harbor [2]	do	832	Sixty-first	do		
Puyallup Waterway [1]	Senate	418	do	do		

[1] No maps.

[2] Contains maps.

No work was done during the year.

The expenditures during the year were for inspections and investigations of complaints in regard to deterioration in the channel depths and obstruction to navigation.

Exports and imports.

Calendar year.	Short tons.	Value.	Calendar year.	Short tons.	Value.
1903	1,715,085	$68,153,845	1908 [1]	1,443,614	$46,128,965
1904	1,561,074	53,726,772	1909	1,097,988½	36,554,486
1905	1,844,338	65,618,183	1910	1,299,206	61,315,442
1906 [1]	1,600,390	51,578,522	1911 [2]	854,799	54,376,069
1907 [1]	1,856,666	55,621,281			

[1] Differs from former reports, due to addition of log traffic. [2] Incomplete.

No definite information is available as to the effect of the improvement on freight rates.

July 1, 1911, balance unexpended	$92,936.00
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	14.27
July 1, 1912, balance unexpended	92,921.73
July 1, 1912, outstanding liabilities	6.85
July 1, 1912, balance available	92,914.88

(See Appendix V V 8.)

9. Waterway connecting Puget Sound with Lakes Union and Washington, Wash.—Lakes Union and Washington are bodies of fresh water near Puget Sound, in the immediate vicinity of the city of Seattle. Lake Union is entirely within the city limits. The proposed improvement originally contemplated a ship canal connecting both lakes with the Sound. There is no navigable connection at present with Lake Union, but Lake Washington, through the Black and Duwamish Rivers, has a navigable connection of limited depth with Puget Sound.

A succinct history of the project and references to reports, etc., may be found on pages 791 to 793 of the Annual Report of the Chief of Engineers for 1907.

The work done under the project adopted by the act of August 18, 1894, consisted of dredging a channel from the Sound to the wharves at Ballard, in Salmon Bay, and the excavation of a cut between Lake Union and Salmon Bay for the control of the water level in Lake Union. The work was done under the river and harbor acts of June 3, 1896, and March 3, 1905. It has resulted in a channel 50 feet wide and 16 feet deep at extreme low water from Puget Sound to a point 2,000 feet west of the lock site. From this point to the lock site the channel is 75 feet wide and 16 feet deep. From the lock site to the railroad trestles at the eastern part of Ballard Harbor the channel is 75 feet wide and 10 feet deep at extreme low water, excepting the temporary channel around the lock site, which is 6 feet deep at extreme low water. A turning basin, ranging from 175 to 500 feet in width, has been dredged at Ballard.

The amount expended for this work and maintenance of outlet gates at Lakes Union and Washington and improving the drainage of Lake Washington was $475,002.45.

The present commerce benefited by the improvement of the channel to Ballard is the towing of logs to the mills at Ballard and the export of lumber and shingles from that place. Logs are brought in in rafts and lumber is loaded on scows at the mills and then towed to the open Sound.

It has not been practicable to determine what effect the improvement work has had upon freight rates.

The river and harbor act of June 25, 1910, made provision for continuing the improvement of this waterway by adopting the plan presented in House Document No. 953, Sixtieth Congress, first session, which contemplates the construction of a double lock, the said lock to be located at The Narrows, at the entrance to Salmon Bay, and an unbroken channelway through Salmon Bay and Lake Union to Lake Washington, the difference in the level of the two lakes to be overcome by lowering the surface of the latter to the plane of the former, at an estimated cost of $3,554,932, the work to be done by the Government being the construction of the double lock and necessary accessory works, which is estimated to cost $2,500,000. The said act made an appropriation of $150,000 and a continuing-contract authorization in the sum of $2,125,000 additional for this work, subject to the following provision—

> That before beginning said work or making such contract or contracts the Secretary of War shall be satisfied that King County or some other local agency will do the excavation in the waterway above the lock to the dimensions recommended in said project and will also secure the United States from liability for any claims or damages on account of the grant made to James A. Moore or his assigns by the act of Congress approved June eleventh, nineteen hundred and six, or on account of the lowering of the level of Lake Washington, raising the level of Salmon Bay, or any other alteration of the level of any part of said waterway.

There has been no modification of the existing project.

On June 30, 1911, the Secretary of War expressed himself as satisfied that King County or some other local agency will do the necessary excavation above the lock, etc., and he authorized the beginning of work under the project adopted by the act of June 25, 1910.

During the year contracts were made for construction of a cofferdam and excavation of the lock pit, installation of pumping plant, dredging a temporary channel around the lock site, and construction of a wharf and sand and gravel bunkers.

On June 30, 1912, the temporary channel, excavation of the lock pit, and 98 per cent of the cofferdam had been completed, the pumping plant installed, and the wharf and bunkers were 85 per cent completed.

Work on temporary buildings, storehouses, trestles, etc., was in progress by hired labor.

Orders have been placed for two cantilever steel cranes, three concrete mixers, and six electric hoists.

Office work on plans and specifications for iron and steel work, parts of machinery, gates, and on general plans of lock walls was in progress.

The amount expended during the fiscal year was $162,957.19, of which $5,078.91 was for maintenance of regulating works at Lakes Union and Washington.

Contracts which involve the removal of 1,677,000 cubic yards of material were made by the district engineer officer, as agent for the State of Washington and King County, for excavation of the greater part of the canal above the locks, under the conditions imposed by the act of June 25, 1910, i. e., that King County or some other agency shall do the excavation in the waterway above the lock.

The work is carried on under continuing-contract authorization made by the act of June 25, 1910, and the balance of the authorization remaining to be appropriated is $1,475,000.

The amount expended to June 30, 1912, under the existing project adopted by the act of June 25, 1910, was $164,467.09, of which $5,078.91 was for maintenance of outlet gates at Lakes Union and Washington.

The sum of $128.15 was received from sales.

The maximum draft that could be carried to the wharves at Ballard June 30, 1912, at extreme low water, was 6 feet. The maximum tidal variation is about 18 feet.

Exports and imports.

Calendar year.	Short tons.	Value.	Calendar year.	Short tons.	Value.
1901	410,565	$2,002,950	1907	797,228	[illegible]
1902	428,073	2,432,401	1908	530,352	3,098,954
1903	524,500	2,219,000	1909 [1]	616,318	[illegible]
1904	584,079	2,520,785	1910	616,988	[illegible]
1905	888,161	4,588,198	1911	598,157	[illegible]
1906	705,841	3,998,410			

NOTE.—The above includes only the present commerce of Ballard and Salmon Bay, Lake Union, and Lake Washington.

The appropriations recommended will be applied to the purchase of materials and the construction of the locks and dam.

Reference to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Puget Sound to Lake Washington	House	[2] 40	Fifty-second	First	1892	[illegible]
Do.[3]	Senate	269	Fifty-fourth	do	1896	2355
Do	House	[2] 335	Fifty-seventh	do	1902	2419
Do	Senate	[2] 127	do	Second	1903	2840
Do.[3]	House	[4] 18	Sixty-first	do		
Do	do	[2] 953	Sixtieth	First		

Contracts have been made by local interests for the execution of the greater part of the excavation required of them, and during the year 117,832 yards of material were removed under these contracts, which call for completion on or before July 1, 1914.

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[1] Differs from report for 1910, due to correction of clerical error.
[2] Contains maps.
[3] No maps.
[4] Committee document.

The existing project involves the construction of a canal from Puget Sound through Salmon Bay and Lake Union to Lake Washington. In adopting this project the river and harbor act of June 25, 1910, authorized the construction by the United States of a lock at The Narrows, at the entrance to Salmon Bay, upon condition that the excavation in the waterway above the lock to Lake Washington should be made by local interests, but no provision was made for the necessary excavation in that part of the waterway below the lock to Puget Sound. The estimated cost of the latter work is $355,000.

In order that this part of the work may be ready by the time the rest of the canal shall be completed, it is believed that provision for dredging the canal below the lock should be made at the next session of Congress. The work, when undertaken, can be prosecuted most advantageously under a single appropriation of the whole amount of $355,000, or with a cash appropriation of a part of this sum and a continuing-contract authorization for the remainder.

July 1, 1911, balance unexpended		$303,490.60
Received from sales		128.15
		303,618.75
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$157,878.28	
For maintenance of improvement	5,078.91	
		162,957.19
July 1, 1912, balance unexpended		140,661.56
July 1, 1912, outstanding liabilities		21,771.90
July 1, 1912, balance available		118,889.66
Amount appropriated by sundry civil act approved Aug. 24, 1912		500,000.00
Amount available for fiscal year ending June 30, 1913		618,889.66
July 1, 1912, amount covered by uncompleted contracts		69,730.57
Amount of continuing contract authorization, act of June 25, 1910		2,125,000.00
Amount appropriated under such authorization		650,000.00
Amount yet to be appropriated		1,475,000.00
Amount (estimated) required to be appropriated for completion of existing project		[1] 1,475,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914:		
For works of improvement		[1] 1,000,000.00
For maintenance of improvement		[1] 5,000.00
Total		[1] 1,005,000.00

(See Appendix V V 9.)

10. Snohomish River, Wash.—The Snohomish River is formed by the junction of the Snoqualmie and Skykomish Rivers at a point 21 miles from Puget Sound, and flows in a northwestern direction. This river has several other outlets or mouths, namely: Ebey Slough, Steamboat Slough, Union Slough, and Old River. None of these outlets has now a navigable depth at low water, the flow being dissipated over the large area of tidal flats at the mouths. The tidal variation at the entrance to these outlets is approximately 15 feet.

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[1] Exclusive of amount available for fiscal year 1913.

The work proposed is the improvement of Old River, which is a part of Everett Harbor, and the work under the existing project has been planned in connection with that already done under the project for improving the harbor at Everett, Wash., adopted by the river and harbor act of August 18, 1894, and modified by joint resolution of Congress approved April 23, 1902. Reference to the original project and to reports is made in the Annual Report of the Chief of Engineers for 1907, page 795, and for 1909, page 884.

The existing project, adopted by the river and harbor act of June 25, 1910, is in accordance with report printed in House Document No. 1108, Sixtieth Congress, second session, and contemplates the concentration of tidal flows and river currents by means of a training dike extending across the bar at the outlet of the Old River Channel to a connection with the existing dike or bulkhead in Everett Harbor, the reenforcement of parts of the old bulkhead, the construction of closing dikes and mattress sills across subsidiary sloughs of the main river, and the dredging of a channel 75 feet wide and 8 feet deep at mean lower low water from the deep channel heretofore excavated in Everettt Harbor to the mouth of Steamboat Slough.

The estimated cost of the work is $280,000.

There has been no modification of the existing project.

During the year 8,305 linear feet of new dike and closing dike 175 feet long were built and 8,820 linear feet of old dike repaired under contract. At the close of the year 84 per cent of the dike work was completed.

A channel of project dimensions and 7,220 feet long was excavated by contract. The dredging was 26 per cent completed at the close of the year.

The upper end of the section of channel completed at the time work was suspended, due to exhaustion of funds, has shoaled from 2 to 5 feet, and from present indications it seems doubtful whether the improvement can be completed as originally contemplated, due to excessive slope of the section of river below Steamboat Slough covered by the dredging project.

The amount expended during the year was $89,876.79, none of which was for maintenance.

The amount expended to June 30, 1912, was $89,880.85, all for improvement.

The sum of $10.20 was received from sales.

The work is being carried on under continuing-contract authorization made by act of February 27, 1911 ($180,000), and the balance to be appropriated under such authorization is $105,000.

It is not expected that the improvement, which is in the nature of a harbor extension, will have any effect on freight rates.

The appropriation recommended will be applied toward completion of the existing project.

Exports and imports.

Calendar year.	Short tons.	Values.
1909	926,183	$7,[illegible]
1910	912,006	8,237,135
1911	910,855	4,152,836

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Snohomish River [1]					1875	798
Do.[1]					1881	2614
Snohomish River (to Lowell)[1]	House	103	Fifty-second	Second	1893	3462
Snohomish River (Stretches Riffle)	do	[2] 163	Fifty-eighth	do	1904	3652
Snohomish River (to Lowell)	do	[2] 1108	Sixty-first	do		

July 1, 1911, balance unexpended	$99,995.94
Received from sales	10.20
	100,006.14
June 30, 1912, amount expended during fiscal year, for works of improvement	89,876.79
July 1, 1912, balance unexpended	10,129.35
July 1, 1912, outstanding liabilities	43.95
July 1, 1912, balance available	10,085.40
Amount appropriated by sundry civil act approved Aug. 24, 1912	75,000.00
Amount available for fiscal year ending June 30, 1913	85,085.40
July 1, 1912, amount covered by uncompleted contracts	101,419.54
Amount of continuing-contract authorization, act of Feb. 27, 1911	80,000.00
Amount appropriated under such authorization	75,000.00
Amount yet to be appropriated	105,000.00
Amount (estimated) required to be appropriated for completion of existing project	[3] 105,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[3] 75,000.00

(See Appendix V V 10.)

11. Skagit River, Wash.—The Skagit River is the largest river in western Washington tributary to Puget Sound. The survey on which the present project was based covered that part of the river from Sedro-Wooley to its mouth, a distance of about 28 miles. For about 18 miles below Sedro the river flows in one channel; it then divides into two branches, the North Fork and the South Fork. Each of the two main forks subdivides into several smaller branches that find their way across the flats into Skagit Bay.

The Skagit River is navigable for light-draft boats at all stages of water from the bar at its mouth to Mount Vernon, 11 miles, and at all stages, except extreme low water, to Avon, 3 miles above Mount Vernon. During ordinary high waters the river is navigable as far as Sauk River, 68 miles from its mouth.

Navigation between the deep water in the river and deep water in Saratoga Passage was impracticable except on tides, due to a bar about 3 miles wide, over which the depths vary from 1 foot to 3 feet on low tide. The tidal variation at the mouth of the river is 12 feet.

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[1] No maps. [2] Contains maps. [3] Exclusive of amount available for fiscal year 1913.

The Skagit River has been improved to the extent of removing snags and similar obstructions to navigation since 1882, under appropriations for the operation of a snagboat on Puget Sound and tributary waters.

The existing project, adopted by the river and harbor act of June 25, 1910, in accordance with plan printed in House Document No. 1188, Sixtieth Congress, second session, contemplates the construction of a training dike from the mouth of the South Fork of the Skagit River across the flats to deep water in Saratoga Passage, regulating dikes and mattress sill near the head of the North Fork, and closing subsidiary channels at the delta of the river. The estimated cost of the work is $100,000, which amount has been appropriated.

There has been no modification of the existing project.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session	Year.	Page.
Skagit River [1]					1881	2605
Do.[2]	House	38	Fifty-first	Second	1891	[illegible]
Skagit River to Sedro-Woolley [2]	do	204	Fifty-fifth	do	1898	3112
Do.[2]	do	1188	Sixtieth	do		

[1] No maps. [2] Contains maps.

The mattress sill and closing dikes in the river and the training dike, 10,450 feet long, at the mouth of the river have been completed. Seven hundred feet of the training dike were built during the fiscal year.

The amount expended during the year was $46,331.25, of which $147.20 was for maintenance.

The amount expended to June 30, 1912, was $99,977, of which $147.20 was for maintenance.

Exports and imports.

Calendar year.	Short tons.	Value.
1909	146,889	$2,781,[illegible]
1910	210,564	3,716,873

NOTE.—Freight statistics previous to 1909 included in Puget Sound and tributary waters, Washington.

The proposed improvement will probably not have any effect on freight rates, as the influence of water competition is already felt; but if successful it will insure a continuance of existing conditions.

The appropriation recommended is for maintenance and will be applied to repair and restoration of dikes, which experience has shown to be necessary.

July 1, 1911, balance unexpended		$46, 354. 25
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$46, 184. 05	
For maintenance of improvement	147. 20	
		46, 331. 25
July 1, 1912, balance unexpended		23. 00
Amount appropriated by river and harbor act approved July 25, 1912		15, 000. 00
Amount available for fiscal year ending June 30, 1913		15, 023. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		[1] 25, 000. 00

(See Appendix V V 11.)

12. *Swinomish Slough, Wash.*—This slough affords an inland sheltered passage for small vessels from Puget Sound proper northward to Bellingham Bay and the Gulf of Georgia, and it is the only means of communication to the town of La Conner, located on the slough. At the northern end the slough opens out through the mud flats of Padilla Bay and on the south into Saratoga Passage through the mud flats, forming the delta of the Skagit River. The total distance from deep water in Saratoga Passage to deep water in Padilla Bay is about 11 miles. This waterway is of great importance to traffic between Puget Sound and points north in giving an inside passage for small craft in rough weather, and an outlet for the agricultural and timber products from the surrounding country.

The original and present project, adopted by Congress by act of July 13, 1892, contemplates dredging a channel 4 feet deep in Saratoga Passage across Skagit Flats, through the shoals of the slough proper, and across the flats of Padilla Bay to deep water, and building dikes in Skagit Bay to control the tidal currents.

This project has not been modified.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year	Page.
Swinomish Slough, Skagit Bay to Padilla Bay.	House	[1] 31	Fifty-second	First	1892	2752
Do	do	[1] 796	Sixty-first	Second		
Swinomish Slough, Skagit Bay to Padilla Bay (map only).					1900	4488

[1] Contains maps.

The dike work completed to date between La Conner and Saratoga Passage is as follows: Pile, brush, and stone dike on the north side of the channel from "Hole in the Wall" to opposite the west end of Goat Island, 7,100 linear feet; on the south side of the channel from the west end of Goat Island to deep water in Saratoga Passage, 3,650 linear feet; from McGlinns Island to the mainland in the direction of La Conner, 3,500 feet; and opposite La Conner 1,500 feet.

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[1] Exclusive of amount available for fiscal year 1913.

No work was done during the year. The expenditures, amounting to $311.85, were for examination of existing works.

The amount expended to June 30, 1912, was $214,602.36, of which $31,545.30 was for maintenance.

On June 30, 1911, the maximum depth of channel at mean lower low water between Saratoga Passage and La Conner was 4 feet.

The average tidal variation is about 8 feet.

Exports and imports.

Calendar year.	Short tons.	Value.	Calendar year.	Short tons.	Value.
1898	19,625	$882,345	1905	48,724	[illegible]
1899	76,636	2,028,454	1906	53,261	[illegible]
1900	74,516	1,611,460	1907	46,289	[illegible]
1901	136,747	2,991,330	1908 [1]		
1902	49,914	1,472,847	1909	54,163	[illegible]
1903	51,399	1,473,197	1910	44,947	[illegible]
1904	56,262	1,539,094	1911	53,247	[illegible]

[1] Not obtainable.

The work accomplished has not had any effect on freight rates.

July 1, 1911, balance unexpended	$10,709.49
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	311.85
July 1, 1912, balance unexpended	10,397.64

(See Appendix V V 12.)

13. Bellingham Harbor, Wash.—This harbor is in the northwestern part of Washington and has a length of 14 miles from north to south and a breadth of 5 miles from east to west.

The mud flats in the harbor extend from the shore line to the 12-foot curve, a distance of 3,400 feet.

A system of harbor lines for this harbor, approved by the Secretary of War under date of June 3, 1892, provides for three waterways leading from deep water to the meander line.

The original project, adopted by Congress by the act of June 13, 1902, contemplates dredging the Whatcom Creek waterway to a depth of 12 feet at mean lower low water and 200 feet wide from deep water as far as the railroad bridge, and to its full width inside this bridge. The estimated cost is $80,000.

A channel 200 feet wide and 12 feet deep at low water, with turning basin at inner end, has been dredged under contract. The channel extends the full length of the waterway, and the basin at the inner end is 330 feet wide and 2,570 feet long.

The work contemplated by this project was completed at somewhat less than the estimated cost, and a larger amount of dredging was done than was expected with the funds available.

The river and harbor act of June 25, 1910, made an appropriation of $15,000 for continuing the improvement of this harbor in accordance with plan printed in House Document No. 1161, Sixtieth Congress, second session, so as to provide for the excavation of the outer portion of this waterway to an actual depth of 26 feet at low water and the inner portion to a depth of 18 feet, at an estimated cost of

$92,250, subject to certain conditions as to cooperation on the part of local interests, as follows:

That the United States shall be under no expense for the construction of bulkheads, groins, or filling, and that before any of the appropriation shall be available for expenditure, or any contract let for the improvement, satisfactory provision shall be made, to be approved by the Secretary of War, that in the prosecution and completion of the work of dredging said channel the cost and charges for the construction of the necessary bulkheads and groins, or for necessary filling, will be furnished upon demand of the United States engineer in charge, and the design and location of said bulkheads and groins shall be subject to his supervision; and that the United States shall have the right to deposit upon the lands adjacent to the waterway all the material excavated therefrom, and that all filling which may be done by other parties shall be in accordance with plans and specifications to be approved by the Secretary of War.

The original project provided for excavation of the Whatcom Creek waterway to a depth of 12 feet at mean lower low water and 200 feet wide from deep water as far as a then existing railroad bridge, located 2,570 feet from the inner end of the waterway, and to its full width inside of this bridge.

The project has been enlarged to provide for the excavation of this waterway to its full width and to an actual depth of 26 feet at mean lower low water in the outer 3,800 feet and to a depth of 18 feet at mean lower low water in the inner 1,300 feet of the waterway.

Reference to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Bellingham Harbor [1]	House	228	Fifty-third	Third	1895	3472
Bellingham Harbor to mouth of Whatcom Creek.	do	[2] 80	Fifty-fifth	First	1897	3478
Whatcom Creek waterway	do	[2] 1161	Sixtieth	Second		

[1] No maps.

[2] Contains maps.

The sum appropriated by the act of June 25, 1910, was so small that little benefit to navigation could be derived from the expenditure, and nothing was done until additional funds were provided. The act of February 27, 1911, authorized a continuing contract for completion of the project and appropriated an additional sum of $25,000 for the work.

The conditions in regard to cooperation by local interests have been complied with and contract for dredging was made, but there were no operations during the year. The amount expended during the year was $1,254.78, and was for field work and expenses incident to making the contract.

The amount expended to June 30, 1912, under the original project, was $58,928.76, of which $1,092.05 was for maintenance and inspections.

The sum of $1.75 was received from sales.

The amount of the continuing-contract authorization is provided by the sundry civil act of August 24, 1912, and will be applied to completion of the existing project.

The maximum draft that could be carried June 30, 1912, at mean lower low water over the full length of channel and turning basin was 12 feet. The range of tide is about 12 feet.

Exports and imports.

Calendar year.	Short tons.	Value.	Calendar year.	Short tons.	Value.
1902	87,118	$2,872,789	1907	319,612	$7,[illegible]
1903	101,989	1,835,486	1908 [1]	350,346	8,[illegible],440
1904	236,669	4,225,480	1909	234,501	8,857,259
1905	254,240	4,690,986	1910	258,294	7,[illegible],072
1906	292,592	5,643,504	1911 [2]	240,122	1,756,[illegible]

[1] Differs from former reports due to addition of log traffic. [2] Incomplete.

The work has not yet produced any material effect on freight rates, so far as known.

The commerce of this port is of a general nature, consisting largely of lumber, shingles, and fish. Vessels of the deepest draft can go as far as the entrance of the proposed dredged channel.

July 1, 1911, balance unexpended	$42,326.02
Received from sales	1.75
	42,327.77
June 30, 1912, amount expended during fiscal year, for works of improvement	1,254.78
July 1, 1912, balance unexpended	41,072.99
Amount appropriated by sundry civil act, approved Aug. 24, 1912	52,250.00
Amount available for fiscal year ending June 30, 1913	93,322.99
July 1, 1912, amount covered by uncompleted contracts	88,560.00
Amount of continuing contract authorization, act of Feb. 27, 1911	52,250.00
Amount appropriated under such authorization	52,250.00

(See Appendix V V 13.)

14. Columbia River between Wenatchee and Bridgeport, Wash.—The Columbia River between Wenatchee and Bridgeport, Wash., is about 80 miles in length, has sufficient depth for all purposes of navigation, and the only difficulties in the way of navigation are the swift currents and rocks and reefs which occupy the channels.

The project adopted by the river and harbor act approved August 18, 1894, for the improvement of the Columbia River between the head of Rock Island Rapids and the foot of Foster Creek Rapids, included the part of the river between Wenatchee and Bridgeport, and the amount expended on the original project was $8,005.20.

The existing project, adopted by act of March 2, 1907, contemplates the improvement of the river between Wenatchee and Bridgeport by the removal of rocks, bowlders, etc., and the construction of dikes and wing dams, at an estimated cost of $42,000.

The work could not be completed within the estimated cost and the river and harbor act of June 25, 1910, made an additional appropriation of $25,000 for this work.

There has been no modification of the project excepting the omission of the dikes and wing dams.

A report on an examination and survey (without maps) was printed in House Document No. 440, Fifty-ninth Congress, second session.

The work done during the fiscal year consisted of completing the middle channel at Entiat Rapids by dredging 44,982 cubic yards of coarse gravel, bowlders, and clay. This channel now has a minimum width of 150 feet and depth of 5 feet at extreme low water and is 3,000 feet long.

The work was done by hired labor and use of Government plant at a cost of $0.248 per cubic yard.

The amount expended during the fiscal year was $10,866.88, all for improvement.

The amount expended to June 30, 1912, was $66,544.86, of which $150 was for maintenance and inspections.

The sum of $850 was received from sales.

The variation in water surface is about 20 feet.

So far as known this improvement has not caused any reduction in freight rates.

Exports and imports.

Calendar year.	Short tons.	Value.	Calendar year.	Short tons.	Value.
1904	24,506	$2,251,590	1908	54,527	$3,368,119
1905	39,827	3,169,060	1909	33,976	3,929,990
1906	53,260	3,901,360	1910	26,144	1,825,270
1907	42,126	3,091,550	1911	13,260	656,670

July 1, 1911, balance unexpended	$11,324.52
Received from sales	850.00
	12,174.52
June 30, 1912, amount expended during fiscal year, for works of improvement	10,866.88
July 1, 1912, balance unexpended	1,307.64

(See Appendix V V 14.)

15. Columbia River between Bridgeport and Kettle Falls, Wash.—The river between the places mentioned is 162 miles long and is navigable for vessels at certain stages of water. The chief obstructions to navigation are rapids, caused at places by immense bowlders and at others by ledges of solid rock.

The original and existing project, adopted by the river and harbor act of June 25, 1910, is in accordance with plan printed in Rivers and Harbors Committee Document No. 16, Sixtieth Congress, second session, and contemplates the removal of rocks and bowlders along the shores between high and low water, those exposed at low water and others that are submerged at low water, to a depth of 7 feet, all at an estimated cost of $100,000, which amount is appropriated by the said act, subject to the provision that the State of Washington shall furnish for the execution of the work the plant owned and employed by it on this section of the river.

The estimated quantity of rock to be removed is 64,000 cubic yards at 30 localities.

There has been no modification of the existing project.

Report on examination and survey, with map, was published in House Committee Document No. 16, Sixtieth Congress, second session.

Report, without map, on examination of Grand or Rickey Rapids, was published in annual report for 1911, page 2641.

The work during the fiscal year consisted of removal of approximately 1,670 cubic yards of submerged rocks and reefs and of bowlders on shore at seven localities, by the use of Government plant and hired labor, at a cost of $19.89 per cubic yard.

The amount recommended to be appropriated will be applied to removal of obstructions above Box Canyon by hired labor and use of Government plant.

The amount expended during the year was $36,836.46, all for improvement.

The amount expended to June 30, 1912, was $85,334.36, none of which was for maintenance. The sum of $3.15 was received from sales.

The proposed improvement will provide an outlet for traffic from territory not now reached by a railroad and will materially reduce the cost of transportation.

July 1, 1911, balance unexpended	$51,505.25
June 30, 1912, amount expended during fiscal year, for works of improvement	36,836.46
July 1, 1912, balance unexpended	14,668.79
July 1, 1912, outstanding liabilities	677.70
July 1, 1912, balance available	13,991.09
Amount appropriated by river and harbor act approved July 25, 1912	25,000.00
Amount available for fiscal year ending June 30, 1913	38,991.09
Amount (estimated) required to be appropriated for completion of existing project	[1] 25,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 25,000.00

(See Appendix V V 15.)

16. *Okanogan and Pend Oreille Rivers, Wash.*—(*a*) *Okanogan River*.—This river rises in Canadian territory, flows in a southerly direction, and empties into the Columbia. The lower portion, for a distance of 87 miles, lies in the northeastern part of Washington. The lower portion has sufficient depth and width for light-draft steamboat navigation for about four months each year, April to July, inclusive, but it is obstructed in places by shoals and rocks, which interfere with navigation during low water.

The original and existing project, adopted by Congress by act of March 3, 1899, contemplates rock removal, the construction of wing dams, and snagging. By act of June 13, 1902, this work and that of the Pend Oreille were consolidated. There has been no modification of this project.

The estimated cost was $30,000 for the Okanogan.

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[1] Exclusive of amount available for fiscal year 1913.

Reference to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress	Session.	Year.	Page.
Okanogan River, mouth to head of navigation.[1]	House	238	Fifty-third	Third	1895	3475
Okanogan River, mouth to international boundary line.	do	[2] 211	Fifty-fifth	Second	1898	3121
Okanogan River [1]	do	359	Sixty-first	do		

Work of removing rocks and bowlders, wing-dam construction, and placing posts to assist vessels in hauling over rapids has been done at various points over about 40 miles of the lower portion of the river.

Cables to assist vessels in passing the rapids were placed at seven places on the Okanogan River.

During the year no work was done on the Okanogan River nor expenditures made.

The amount expended to June 30, 1912, was $38,066.75, of which $6,102.41 was for maintenance. The sum of 60 cents was received from sales.

The extreme variation of water levels at the junction with the Columbia is 37 feet; extreme variation 6 miles above said junction, 20 feet.

The commerce of the river is carried on in small river steamers and consists of general traffic.

Reference is made to the opinions expressed in the report of preliminary examination of the Okanogan River, made in compliance with the provisions of the river and harbor act of March 3, 1909, printed in House Document No. 359, Sixty-first Congress, second session. For the reasons shown in that report the Okanogan River is not considered worthy of further improvement by the General Government.

Exports and imports.

Calendar year.	Short tons.	Value.	Calendar year.	Short tons.	Value.
1899	1,733	$151,415	1906	1,960	$253,880
1900	(3)	(3)	1907	2,040	400,100
1901	963		1908	1,104	210,040
1902	1,571	119,065	1909	1,171	193,200
1903	6,317	458,705	1910	1,338	120,037
1904	1,636	252,414	1911	1,529	128,914
1905	1,184	228,675			

[1] Not obtainable.

The freight rates on this river are believed to have been materially reduced since the work started, but no definite information is available.

July 1, 1911, balance unexpended $1,928.43
July 1, 1912, balance unexpended 1,928.43

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[1] No maps. [2] Contains maps. [3] Not obtainable.

(*b*) *Pend Oreille River.*—This river forms the outlet of Pend Oreille Lake, in the northern part of Idaho.

The obstructions to navigation consist of rocks and shoals in Box Canyon and in the section between this canyon and Albany Falls.

The original and existing project, adopted by Congress by act of March 3, 1899, contemplates the improvement of Box Canyon by the removal of submerged rocks, the blowing off projecting rocky points, and the removal of submerged rocks between Box Canyon and Albany Falls. The estimated cost was $30,000.

A modified project, approved March 29, 1907, provides for dredging to a depth of 6 feet at low water through the bars in the Pend Oreille River between Newport and Box Canyon.

The existing project contemplated the improvement of Box Canyon by the removal of submerged rocks and blowing off projecting rocky points and the removal of submerged rocks between Box Canyon and Albany Falls.

This project was modified to provide for dredging a channel 6 feet deep at low water through the bars in the Pend Oreille River between Newport and Box Canyon.

Report on survey of Pend Oreille River from Lake Pend Oreille, Idaho, to Metalline, Wash., with map, was published in House Document No. 235, Fifty-fifth Congress, second session, and in annual report for 1898, page 3124, without map.

Report, without map, on an examination of this river between Newport and foot of Box Canyon was published in House Document No. 410, Sixty-first Congress, second session.

There were no operations and no expenditures during the year.

The amount expended to June 30, 1912, was $32,209.26, of which $1,531.26 was for maintenance and inspections.

Channels 75 feet wide and 6 feet deep at low water were dredged through the upper and lower bars at Boundary Island. The quantity of material removed was 6,938.6 cubic yards. Work was suspended on April 28, 1909, on account of high stage of river.

During the working season of the year 1910, 5,892 cubic yards of material were removed from Congress and Yakima bars.

On account of unsatisfactory progress of the work and the doubtful benefit to be derived from further improvement of the river, the contract was annulled on April 14, 1910.

A railroad has recently been completed between Newport and Ione, and will soon be extended beyond the head of Box Canyon. Since the completion of the railroad to Ione there has been no boat navigation on that part of the river, except towage of piling and poles, and the depths in the river are sufficient for the class of vessels engaged in existing traffic. The railroad has absorbed practically all of the river traffic and there has been no regular boat service on the river since the railroad was built.

For these reasons the Pend Oreille River between Newport and Box Canyon is considered unworthy of further improvement by the Government, and it is therefore recommended that the necessary congressional action be taken to abandon further work on the Pend Oreille River under the existing project.

Navigation through Box Canyon is possible except at high stage of water, but the danger in going down through the canyon and the expense of lining up are so great that river boats do not use it.

The river is navigable throughout the year from Newport down to Box Canyon, a distance of 54 miles, except occasional interruption from ice. A channel depth of about 3 feet can be depended on.

The extreme variation of water levels in the main river is from 17 to 20 feet; in Box Canyon the difference between extreme high and extreme low water is 48 feet.

The commerce consists of towing logs and poles carried on by a number of small vessels.

Exports and imports.

Calendar year.	Short tons.	Value.	Calendar year.	Short tons.	Value.
1899	2,617	$129,677	1906	32,943	$501,834
1900	1,921	97,125	1907	2,227	152,500
1901	13,917	134,280	1908	21,724	123,000
1902	15,868	500,200	1909	4,679	101,120
1903	27,100	758,000	1910 [1]		
1904	39,974	358,453	1911 [1]		
1905	54,783	462,814			

[1] Not obtainable.

No effect on freight rates directly attributable to the improvement have been reported.

July 1, 1911, balance unexpended	$10,296.16
July 1, 1912, balance unexpended	10,296.16
July 1, 1912, amount covered by uncompleted contracts	1,250.00

CONSOLIDATED.

July 1, 1911, balance unexpended	$12,224.59
July 1, 1912, balance unexpended	12,224.59
July 1, 1912, amount covered by uncompleted contracts	1,250.00

(See Appendix V V 16.)

17. Polson Bay, Flathead Lake, Mont.—Polson Bay is the name given to the extreme southern end of Flathead Lake. It is applied particularly to that section of the lake shore immediately in front of the town of Polson, which lies just at the outlet of the lake. Polson is on the Flathead Indian Reservation, and at present has a very small white population, limited to individuals who hold traders' licenses. It is accessible by boat from the head of the lake, or by stage from Ravalli, a town on the Northern Pacific Railway, 35 miles south.

Flathead Lake is subject to great fluctuations in level, due to the fact that its river outlet passes through a narrow gorge, which prevents the rapid discharge of flood waters. It is stated that this fluctuation in level is about 15 feet.

The low-water depth in the lake is sufficient throughout the greater part of its area for the vessels now navigating it, but near the southern and eastern shores there are considerable areas of shoal water which make it difficult for boats to land. In front of Polson the shoal water extends for a distance of from a quarter to a half mile from shore. The bottom of the bay at this point appears to be composed generally of soft clay, but mixed with it and lying upon the surface are a considerable number of small bowlders, which it is supposed were brought down by ice from the rocky shores of Flathead Lake.

The present steamboat landings extend into the bay from the high-water line about 400 feet to a point where the low-water depth is from 3 to 4 feet. The long flat in front of them, the great fluctuation in level, and the danger of damage from ice would make the extension of these wharves to deep water a costly undertaking, hence the desire to have a channel dredged from deep water in the lake up to the wharves. Navigation interests have themselves made small expenditures in improving the approach to the wharves by the removal of bowlders, but the work accomplished has not been sufficient to prevent vessels of the screw-propeller type from striking frequently these bowlders and damaging their wheels when approaching or leaving the wharves at Polson.

The original and existing project adopted by the river and harbor act of June 25, 1910, is in accordance with plan printed in House Document No. 645, Sixty-first Congress, second session, and provides for the removal of bowlders and other obstructions which interfere with the approach to the landing wharves and for obtaining a channel 100 feet wide and 6 feet deep at low water, with a turning basin near the wharves, at an estimated cost of $6,000, which amount was appropriated by the act.

Report, without map, on an examination and survey of Polson Bay was published in House Document No. 645, Sixty-first Congress, second session.

There has been no modification of the project.

There were no operations nor expenditures during the year.

The amount expended to June 30, 1912, was $4,491.14, none of which was for maintenance.

The work contemplated by the project has been completed.

Traffic.

1910. 70,000 short tons, valued at	$1,320,000
1911. 72,466 short tons, valued at	256,500

It is not expected that the proposed improvement will have any effect on freight rates at the locality.

July 1, 1911, balance unexpended	$1,508.86
July 1, 1912, balance unexpended	1,508.86

(See Appendix V V 17.)

18. St. Michael Canal, Alaska.—The St. Michael Canal is a channel running from St. Michael Bay to a point on Norton Sound about 38 miles from the Apoon mouth of the Yukon River.

The port of St. Michael is about 3 miles from the mouth of the canal.

The main part of the canal has sufficient water for the navigation of river boats plying on the Yukon River. The eastern entrance to the canal is, however, obstructed by shoals, and in the eastern portion there are several sharp bends that could be turned with difficulty by the larger river boats.

The object of the improvement of the canal is to provide a sheltered passage to river boats between St. Michael and the mouth of the Yukon River.

The original and existing project contemplates dredging in the South Branch a channel 100 feet wide to a depth of 6 feet at mean low water at the entrance to the canal and the excavation of a cut of the same dimensions across the first bends. The estimated cost was $248,000. The project was adopted by the act of March 2, 1907, and the full amount of the estimate has been appropriated.

To June 30, 1912, there has been expended on the existing project $377,044.16, none of which was for maintenance. The sum of $25 was received from sales.

The original estimate for this work was based on a unit price for dredging of 50 cents per cubic yard, while the lowest bid received was $1.45 per cubic yard.

To carry out the original project would require an additional appropriation of nearly double the amount heretofore appropriated.

The river and harbor act of June 25, 1910, modified this project, in accordance with report printed in Senate Document No. 416, Sixty-first Congress, second session, so as to provide a reasonably good channel without the expensive cut-offs, by continuing the dredging from point "A" to station "11 A," excavating where necessary between station "11 A" to point "B," and at two sharp bends between station "11 A" and station "28 A," as shown on map accompanying the said document, at an estimated cost of $143,000, which sum was appropriated by the act.

Reference to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
St. Michael Canal [1]	House	389	Fifty-ninth	Second		
Do.[1]	do	416	Sixty-first	do		
Apoon, mouth of Yukon River [1]	do	556	Sixty-second	do		

[1] Contains maps.

The existing project contemplates dredging a channel 100 feet wide and 6 feet deep at mean low water from deep water in St. Michael Bay through the canal for a distance of 6½ miles, and land cuts of the same dimensions to eliminate several short bends.

This project was modified to provide for a reasonably good channel 7½ feet deep at mean low water and widening the channel at two sharp bends, with omission of the land cuts at the bends.

The work under the project adopted by the act of March 2, 1907, has been completed as far as funds will permit. The work was done under a continuing contract during the seasons of 1908 and 1909. A channel 2.6 miles long, 100 feet wide, and 6 feet deep was excavated and 157,990 cubic yards of material removed.

With funds provided by the act of June 25, 1910, operations under the modified project were resumed under contract on June 28 and completed on August 13, 1911. The project channel dimensions were secured by excavation of 133,515 cubic yards of material, of which 36,415 cubic yards were removed during the working season of 1911.

The amount expended during the year was $37,295.57, none of which was for maintenance.

The maximum draft that can at present be carried at low water is 8 feet. The mean range of tide is 3½ feet.

Statement of freight between St. Michael and mouth of Yukon River.

Calendar year.	Short tons.	Value.	Calendar year.	Short tons.	Value.
1897	5,270	$512,650	1904	17,356	[illegible]
1898	22,117	2,132,580	1905	25,855	[illegible]
1899	17,295	1,704,525	1906	[illegible]	[illegible]
1900	19,153	1,950,950	1907	29,798	[illegible]
1901	18,158	1,844,651	1908 [1]	23,941	[illegible]
1902	16,008	1,630,950	1909	30,034	[illegible]
1903	20,000	1,652,891	1910	24,622	[illegible]

[1] Differs from report for 1910, due to addition of fuel-oil traffic and foreign shipments.

It is not expected that this improvement will have any effect on freight rates.

July 1, 1911, balance unexpended	$51,252.96
Received from sales	25.00
	51,277.96
June 30, 1912, amount expended during fiscal year, for works of improvement	37,295.57
July 1, 1912, balance unexpended	13,982.39

(See Appendix V V 18.)

19. Apoon mouth of Yukon River, Alaska.—This is the most easterly of the delta channels into which the Yukon River is divided, and is used by all vessels plying between points on this river and the port of St. Michael.

In its original condition there are not sufficient depths at two localities between Pastol Bay and Kotlik Crossing, a distance of 7½ miles, nor width of channel at three bends to accommodate existing traffic. The least depth at the bars is 2.9 feet at mean low water. The channel widths at the bends where the depths are 6 feet or greater at mean low water vary from 80 feet to 140 feet. The tidal range is 3 feet 3 inches.

The original and existing project of December 8, 1911, adopted by the river and harbor act of July 25, 1912, provides for excavation of channels 6 feet deep at mean low water and 150 feet wide through the bars and of the same depth and 200 feet wide at the bends, at an estimated cost of $130,000 for first construction.

A report, with maps, upon an examination and survey was published in House Document No. 556, Sixty-second Congress, second session.

There has been no modification of the original project.

There were no operations nor expenditures during the year.

Commerce.

	Short tons.
1910	24,622
1911	33,660

No direct result upon freight rates is expected from the improvement.

The amount carried in the river and harbor act of July 25, 1912, is sufficient to complete the work contemplated by the existing project.

Amount appropriated by river and harbor act approved July 25, 1912	$130,000
Amount available for fiscal year ending June 30, 1913	130,000

(See Appendix V V 19.)

EXAMINATION AND SURVEY OF COLUMBIA RIVER, MOUTH OF SNAKE RIVER TO WENATCHEE, WASH., MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED MARCH 3, 1909.

Reports dated June 9, 1909, and July 11, 1911, on preliminary examination and survey, respectively, of Columbia River, from the mouth of Snake River to Wenatchee, Wash., required by the river and harbor act approved March 3, 1909, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 693, Sixty-second Congress, second session. The improvement of this locality by the United States in the manner apparently desired is not deemed worthy of being undertaken at the present time.

EXAMINATIONS AND SURVEYS MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports on preliminary examinations and surveys required by the river and harbor act approved June 25, 1910, of the following localities within this district were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in documents as indicated.

1. *Preliminary examination and survey of Hoquiam River, Wash.*—Reports dated October 18, 1910, and March 22, 1911, are printed in House Document No. 268, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $12,325 for first construction, with $1,000 annually for maintenance, is presented, subject to certain specified local cooperation.

2. *Preliminary examination of harbor of refuge at Neah Bay, Wash., or at such other points in the vicinity thereof as will best subserve the interests of commerce and navigation.*—Report dated April 13, 1911, is printed in House Document No. 472, Sixty-second Congress, second session. The establishment of a harbor of refuge in this vicinity is not deemed advisable at the present time.

3. *Preliminary examination and survey of ship canal between Port Townsend Bay, Puget Sound, and Oak Harbor, Wash.*—Reports dated November 5, 1910, and December 9, 1911, are printed in House Document No. 625, Sixty-second Congress, second session. A plan of improvement at an estimated cost of $62,500 for first construction is presented.

4. *Preliminary examination and survey of Skagit River, Wash., from Sedro-Woolley to Baker.*—Reports dated November 5, 1910, and February 29, 1912, with map, are printed in House Document No. 909, Sixty-second Congress, second session. The improvement of this locality by the United States in the manner desired is not deemed worthy of being undertaken at the present time.

EXAMINATION AND SURVEY MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Reports dated July 10, 1911, and December 8, 1911, with map, of preliminary examination and survey, respectively, of *Apoon, mouth of Yukon River and Pastol Bay to the mouth of Kotlik River, Alaska,* required by the river and harbor act approved February 27, 1911, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 556, Sixty-second Congress, second session. A plan of improvement, at an estimated cost of $130,000 for first construction, is presented.

The local officer was also charged with the duty of making other preliminary examinations and surveys required by the river and harbor acts approved June 25, 1910, and February 27, 1911, as follows, and reports thereon will be duly submitted when received:

1. *Sammamish River, Wash.*
2. *Duwamish River, Wash.*
3. *East and West Waterways in Seattle Harbor, Wash.*, with a view to maintenance by the United States Government.
4. *Edmonds Harbor, Wash.*
5. *Entrance to Kuskokwim River, through Kuskokwim Bay, Alaska.*
6. *Surgius Narrows, Alaska.*

RIVER AND HARBOR IMPROVEMENTS IN THE DISTRICT OF HAWAII.

This district was in the charge of Capt. A. B. Putnam, Corps of Engineers, to July 20, 1911, and of Maj. W. P. Wooten, Corps of Engineers, since that date. Division engineer, Lieut. Col. Thomas H. Rees, Corps of Engineers.

1. *Honolulu Harbor, Hawaii.*—This harbor is situated on the south coast of the island of Oahu, about 9 miles east of Pearl Harbor. The entrance channel, through a coral reef, and the harbor proper, were dredged from time to time by the monarchial, republican, and territorial governments of Hawaii prior to July 1, 1904. On this date there existed an entrance channel having a minimum width of about 200 feet and a depth of about 35 feet at mean low water. The harbor proper had a general width of 900 feet. The water for about 200 feet immediately along the wharves had a depth of from 30 to 32 feet. Elsewhere there was only about 27 feet at low water. The bend at the lighthouse point was so sharp as to make it somewhat difficult for large vessels to make the turn. The harbor has an area of 184.5 acres included within the harbor lines, the present governing dimensions being 3,000 feet by 850 feet for 30-foot depth, or 3,000 feet by 600 feet for 35-foot depth.

Work on the present project was begun under an appropriation by the river and harbor act of March 3, 1905, in accordance with a general plan printed in the Annual Report of the Chief of Engineers for 1905, page 2564, but the project as specifically adopted by the river and harbor act of March 2, 1907, is printed in House Document No. 332, Fifty-ninth Congress, second session. It provides for an entrance channel 400 feet wide and 35 feet deep at mean low water from deep water at the entrance to the lighthouse point, for easing the curve at the junction of the entrance channel and the inner harbor by cutting off the lighthouse point, and for enlarging the harbor proper so that it will have a general width of 1,200 feet and a depth of 35 feet at mean low water, at an estimated cost of $1,628,894.60. No change has been made since the original project was adopted.

Between March 3, 1905, and May 27, 1908, $800,000 had been appropriated for work under the approved project, or about 49 per cent of the estimated cost.

Work under the above appropriations was stopped by practical exhaustion of funds on December 15, 1908, the following having been accomplished:

Dredging entrance channel, removing lighthouse point, and the partial widening of the harbor proper. All this dredging was to a depth of 35 feet at mean lower low water, a total of 1,910,023 cubic yards having been excavated.

For the maintenance of this harbor an allotment of $25,000 was made from the act of March 3, 1909, and during the summer of that year bids were asked for dredging the shoal places. The only bid received was rejected as excessive.

By the river and harbor act of June 25, 1910, Congress appropriated $150,000 for continuing improvement at this harbor, and from funds thus provided and from the allotment above referred to, for maintenance, two contracts were let in November, 1910, one for dredging at the north end of the harbor, and one for redredging the entrance channel. Work at the north end of the harbor was commenced in December, 1910, and completed in August, 1911; 152,063 cubic yards were removed, thereby making available for wharfage purposes an additional 500 linear feet for vessels drawing 35 feet. Work on redredging was commenced February 6, 1912, and completed March 2, 1912; 99,500 cubic yards were removed.

A survey of the harbor was made during the year. Due to the soft character of the harbor bottom, the maneuvering of steamers causes deepening in places and shoaling in others. The outer 600 feet of the entrance channel has shoaled to 33 feet in places, which is now the maximum draft under which vessels can enter the port.

On June 30, 1912, the sum of $929,204.05 had been expended on the project, and $27,345.08 had been expended for maintenance.

During the year $2 was received from the sale of maps pertaining to the appropriation.

On June 30, 1912, there was a minimum depth in the entrance channel of about 33 feet; within the harbor proper there was, outside of harbor lines, a general depth of 35 feet. The normal tidal oscillation is about 2 feet. The head of navigation is the head of the harbor, about 2 miles from the Lighthouse Department buoys marking the entrance to the harbor.

The commerce between this port and ports not in the Hawaiian Islands, for the calendar year 1911, amounted to approximately 802,311 short tons, valued at $48,943,819. The commerce with other ports of the Hawaiian Islands amounted to 362,398 short tons, valued at about $22,461,850, making a total of 1,164,709 short tons, valued at approximately $71,405,669.

What effect the improvement of the harbor has had upon freight rates can not be stated, but vessels are now able to enter and leave the harbor with their full-load draft.

The approved project for this harbor is about 70 per cent completed. Practically all of the harbor frontage available for wharfage purposes is now occupied, and the wharves are not sufficient to accommodate the present commerce without frequent congestion. It is recommended that an appropriation of $200,000 be made, with a continuing-contract provision for the balance required to complete the approved project. If this amount is made available, it is believed that a much more satisfactory price for dredging can be obtained than will be the case if a number of small contracts must be made. The United States will also be in a position to buy or build a plant and do their own work if a satisfactory price is not bid for dredging, while, if only a small amount of money is available, they will not have this course to fall back on.

When additional appropriations are made for this harbor, it is proposed to widen the harbor in accordance with the approved project.

July 1, 1911, balance unexpended		$125,623.09
Proceeds of sales		2.60
		125,625.69
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$80,119.12	
For maintenance of improvement	27,039.20	
		107,158.32
July 1, 1912, balance unexpended		18,467.37
July 1, 1912, outstanding liabilities		148.73
July 1, 1912, balance available		18,318.64
Amount (estimated) required to be appropriated for completion of existing project		[1] 678,894.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 225,000.00

(See Appendix W W 1.)

2. *Harbor at Hilo, Hawaii.*—The island of Hawaii is the largest and most southerly of the Hawaiian Group. Hilo Bay is on the east side of the island, about 200 miles southeast from Honolulu, the commercial center of the Hawaiian Group.

The harbor is practically an open roadstead exposed through the angle from about north to N. 74° E., which angle is slightly protected from N. 34° E. to N. 74° E. by Blonde Reef, over which there is an average depth of 22 feet. Kuhio Bay extends into this reef, and has an area of 53.5 acres, with a depth of 35 feet at mean lower low tide, but the entrance is blocked by shoals which will require the removal of 115,000 cubic yards. This bay will be entirely protected by the breakwater, and is already well protected by the present completed portion of the breakwater. It is believed that this bay will be the main shipping point of the harbor. A large anchorage basin of deep water at the entrance to Kuhio Bay will receive protection from the breakwater.

The present project, adopted by Congress March 2, 1907, provides for constructing a rubber-mound breakwater 10,170 feet long on Blonde Reef from a point on shore about 6,000 feet east of Cocoanut Island, at an estimated cost of $1,700,000, as stated in House Document No. 407, Fifty-ninth Congress, second session.

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[1] Exclusive of balance unexpended July 1, 1912.

As authorized in the act of March 2, 1907, the project as originally stated in the above-mentioned House document has been modified in a manner recommended on page 16 of the document by the elimination of the third or shore arm of the breakwater and the extension of the middle arm of the breakwater to the shore.

For map, see page 2316 of the Annual Report of the Chief of Engineers for 1908.

For this harbor Congress has appropriated $850,000, and the river and harbor act of February 27, 1911, authorized continuing contracts for the further prosecution of the project in the additional sum of $250,000, of which $150,000 remains to be appropriated.

This act also provided for a resurvey of the harbor with a view to determining whether a modification of the adopted project can be made which will increase the commercial facilities of the harbor without increasing the original limit of cost of the work. Report thereon was submitted and published in House Document No. 417, Sixty-second Congress, second session. This report recommended a modification of the project so as to provide for dredging to a depth of 35 feet the entrance to Kuhio Bay, at an estimated cost of $76,000, and for continuing the breakwater along the approved lines as far as can be done without increasing the original limit of cost of the work. This project was adopted by the river and harbor act approved July 25, 1912, which made an appropriation of the above amount for completing the required dredging.

On June 30, 1912, $682,897.10 has been expended on the present project, no part being for maintenance. During the year $2.50 was received from the sale of maps.

The work of breakwater construction was continued during the fiscal year, 41,208 tons of rock having been placed in the breakwater. Up to June 30, 1912, a total of 245,777 tons of rock have been placed in the breakwater, completing 2,528 feet thereof, and 2,486 feet of substructure in advance of the completed portion. The project is considered to be 35 per cent completed, and the protection is already felt as far as the Hilo Railway Wharf. The Territorial government has awarded a contract for a wharf close to the breakwater, which will be fairly well protected by the present completed portion of the breakwater, and will accommodate vessels drawing 35 feet at mean lower low tide.

The commerce of this port for the calendar year 1911 amounted to approximately 308,381 short tons, valued at $17,404,861.

Work on this improvement has not been carried far enough to have any effect on freight rates.

The additional work proposed is necessary to make the breakwater effective as a protection to additional wharves and anchorage. The amount recommended for expenditure in the fiscal year 1914 will be applied to continuing the substructure of the breakwater in advance of the superstructure.

July 1, 1911, balance unexpended	$428,001.55
Proceeds of sales	2.50
	428,004.05
June 30, 1912, amount expended during fiscal year, for works of improvement	160,897.15
July 1, 1912, balance unexpended	267,106.90
July 1, 1912, outstanding liabilities	678.22

July 1, 1912, balance available	$266,433.68
Amount appropriated by sundry civil act approved Aug. 24, 1912	100,000.00
Amount appropriated by river and harbor act approved July 25, 1912	76,000.00
Amount available for fiscal year ending June 30, 1913	442,433.68
July 1, 1912, amount covered by uncompleted contracts	473,586.99
Amount of continuing contract authorization, act of Feb. 27, 1911	250.000.00
Amount appropriated under such authorization	100.000.00
Amount yet to be appropriated	150.000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 750,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 150,000.00

(See Appendix W W 2.)

3. Kahului Harbor, Island of Maui, Hawaii.—The island of Maui is the second in size of the Hawaiian group, and Kahului Harbor is situated about 110 miles east-southeast of Honolulu, the commercial center of the Hawaiian Islands, and about 100 miles northwest of Hilo, island of Hawaii.

Previous to the adoption of the project for the improvement of the harbor of Kahului, it had been improved by the Kahului Railroad Co., at its own expense, by the construction of a breakwater 1,800 feet long, located on top of a coral reef on the eastern side of the harbor, and the excavation within the area protected by this breakwater of some 300,000 cubic yards of material, which was deposited to the windward of the breakwater. In ordinary weather this breakwater afforded ample protection for the smaller vessels which anchored within the dredged basin, but was of little benefit to the larger vessels, which had to anchor out at sea. Under the present project, about 12 acres having a depth of 35 feet will be protected by the breakwater.

Since the project for improving this harbor was adopted, about 450 feet of the outer end of this breakwater was damaged by storms, a portion being entirely swept away.

The existing project, adopted by the river and harbor act of June 25, 1910, is in accordance with plan printed in House Document No. 593, Sixty-first Congress, second session, and provides—

(*a*) For extending the breakwater to American Girl rock;

(*b*) For dredging to a depth of 35 feet the area in the eastern part of the harbor to a new bulkhead line about 68 feet from and parallel to the existing bulkhead line B—C, which is to be advanced by that amount; and

(*c*) For dredging to a depth of 35 feet the area in the western part of the harbor to a line about midway between lines R–E and R–Q, all at an estimated cost of $375,000.

No modification has been made in the original project.

The said act appropriated $150,000 for commencing the work, subject, however, to the conditions mentioned in the document on which the project is based, that the Kahului Railroad Co. cede to the United States, free of cost, any rights it may have in the existing breakwater, and agree to make no claim for reimbursement for work done by it in constructing the breakwater and improving the harbor;

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[1] Exclusive of amount available for fiscal year 1913.

also, that the agreement between the railroad company and the Territorial government, covering the construction and operation of a wharf and wharf shed, providing for its use by the public, be extended so as to provide that the plans to be adopted shall include a public street of proper width giving access to the wharf.

The conditions having been complied with, a contract was entered into for the construction of the breakwater December 8, 1910. Work was commenced April 22, 1911, and completed March 9, 1912. A total of 75,000 tons of rock was placed. The breakwater is now 2,150 feet long and has made a wonderful improvement in the loading of vessels.

The sum of $150,000 was appropriated by the river and harbor act approved February 27, 1911. A contract for the expenditure of these funds by dredging was entered into on November 28, 1911, and work was commenced on May 20, 1912. At the close of the fiscal year, 52,000 yards had been dredged. This contract is about 22 per cent completed. The dredging has not been sufficiently advanced to affect the harbor.

The approved project is about 44 per cent completed.

On June 30, 1912, $157,203.65 had been expended on the project, none of which was for maintenance. During the year, $1.50 was received from the sale of maps.

The improvements have not been sufficiently advanced to affect freight rates.

The present annual commerce of Kahului with ports not in the Hawaiian Islands amounts to about 170,533 short tons, valued at $11,061,180, while the commerce between Kahului and other ports in the Hawaiian Islands was 26,866 short tons, making a total annual tonnage of 197,399, about six times as great as the commerce 11 years ago.

For report on examination and survey of this harbor, see House Document No. 593, Sixty-first Congress, second session.

July 1, 1911, balance unexpended	$291,540.95
Proceeds of sales	1.50
	291,542.45
June 30, 1912, amount expended during fiscal year, for works of improvement	148,744.60
July 1, 1912, balance unexpended	142,797.85
July 1, 1912, outstanding liabilities	393.96
July 1, 1912, balance available	142,403.89
Amount appropriated by river and harbor act approved July 25, 1912	100,000.00
Amount available for fiscal year ending June 30, 1913	242,403.89
July 1, 1912, amount covered by uncompleted contracts	129,909.60

(See Appendix W W 3.)

EXAMINATION AND SURVEY MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Reports dated November 25, 1910, and December 22, 1911, on preliminary examination and survey, respectively, of *harbors of the Island of Kauai, Hawaii, with a view to determining the best loca-*

tion for a port, required by the river and harbor act approved June 25, 1910, were duly submitted by the district officer. They were reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and were transmitted to Congress and printed in House Document No. 609, Sixty-second Congress, second session. A plan for improvement of Nawiliwili Harbor, at an estimated cost of $1,086,000 for first construction and $10,000 annually for maintenance, is presented.

RESURVEY MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED FEBRUARY 27, 1911.

Report dated December 16, 1911 (with map), on resurvey of *Hilo Harbor, Hawaii*, with a view to determining whether a modification of the adopted project can be made which will increase the commercial facilities of the harbor without increasing the original limit of cost of the work, required by the river and harbor act approved February 27, 1911, was duly submitted by the district officer. It was reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and was transmitted to Congress and printed in House Document No. 417, Sixty-second Congress, second session. A plan for the modification of existing project, without increasing the originally estimated cost, is presented.

HARBOR LINES IN PEARL HARBOR, HAWAII.

An allotment of $1,000 was made from the river and harbor act of June 25, 1910, for the expenses of a survey to establish and mark harbor lines in Pearl Harbor, Hawaii. The harbor lines were approved by the Secretary of War March 8, 1912.

RIVER AND HARBOR IMPROVEMENT IN THE DISTRICT OF PORTO RICO.

This district was in the charge of Col. S. W. Roessler, Corps of Engineers. Division engineer, Col. William T. Rossell, Corps of Engineers.

1. *Harbor at San Juan, P. R.*—This harbor has a large area, but prior to work under the existing project a small portion had sufficient depth for modern shipping. With the exception of a small area in the bend around La Puntilla, which had a depth of 30 feet, the available depths varied from 20 to 30 feet. All of these depths are referred to mean low water. The usual range between high and low water is about 1 foot. The existing project adopted by the river and harbor act of March 2, 1907, is to dredge an entrance channel 600 feet wide from deep water outside to a point opposite Morro Point; 500 feet wide from there to La Puntilla, both to be 30 feet deep, and both to be widened where they make the turn around these points; and to dredge, east of La Puntilla, harbor areas amounting to 398,600 square yards to a depth of 30 feet and 70,200 square yards to a depth of 24 feet, all in accordance with House Document No. 914, Fifty-ninth Congress, first session.

The estimated cost of this improvement is $757,500, of which the act of March 2, 1907, appropriated $157,500, and authorized continuing contracts for prosecuting the project in the sum of $600,000. Of this amount the sundry civil acts of May 27, 1908, March 4, 1909, and June 25, 1910, appropriated $220,000, $300,000, and $80,000, respectively, completing the appropriation. The river and harbor act of June 25, 1910, appropriated $20,000 for maintenance. The amount expended on the existing project up to June 30, 1912, is $730,515.16 for improvement and $20,000 for maintenance.

Work under this project was commenced January 21, 1908, and was completed February 3, 1911. The total material removed was 1,850,751 cubic yards of soft material, at a cost of $341,097.89, and 52,467.97 cubic yards of rock, at a cost of $355,899.98.

Bulkhead and pierhead lines for part of San Juan Harbor were submitted to the Chief of Engineers on April 23, 1912, and were approved by the Secretary of War May 25, 1912.

July 1, 1911, balance unexpended	$31,133.82
June 30, 1912, amount expended during fiscal year, for works of improvement	4,148.98
July 1, 1912, balance unexpended	26,984.84

(See Appendix X X 1.)

2. *Removing sunken vessels or craft obstructing or endangering navigation.*—Wrecks of the schooner *Mary B. Pierce* and the lighter *Indie*, abandoned in Mayaguez Harbor, P. R., were removed at a total cost of $2,015.29.

(See Appendix X X 2.)

PRELIMINARY EXAMINATION OF PALMAS ALTAS HARBOR, P. R., MADE IN COMPLIANCE WITH RIVER AND HARBOR ACT APPROVED JUNE 25, 1910.

Report dated November 3, 1910, on preliminary examination of *Palmas Altas Harbor, P. R.*, required by the river and harbor act approved June 25, 1910, was duly submitted by the district officer. It was reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and was transmitted to Congress and printed in House Document No. 568, Sixty-second Congress, second session. The improvement by the United States of this harbor in the manner apparently desired is not deemed advisable at the present time.

The local officer was also charged with the duty of making a preliminary examination and survey provided for by the river and harbor act approved February 27, 1911, of *San Juan Harbor, P. R.*, and reports thereon will be duly submitted when received.

OHIO RIVER.

The river and harbor act approved June 25, 1910, adopted a project for the improvement of the entire Ohio River by the construction of locks and movable dams, with a view to securing a navigable depth of 9 feet, in accordance with the report submitted in House Document No. 492, Sixtieth Congress, first session, or such modification thereof as, in the discretion of the Secretary of War, may be advisable, and with a view to the completion of such improvement within a period of 12 years. Since the adoption of this project the items making appropriations for the work, exclusive of locks and dams previously authorized, are as follows:

[River and harbor act of June 25, 1910.]

Improving Ohio River: Continuing improvement with a view to securing a navigable depth of nine feet, in accordance with the report submitted in House Document Numbered Four hundred and ninety-two, Sixtieth Congress, first session, or such modification thereof as in the discretion of the Secretary of War may be advisable, and with a view to the completion of such improvement within a period of twelve years, one million one hundred and fifty thousand dollars, which amount shall be applied to the purchase of sites for eighteen Locks and Dams Numbered Nine, Ten, Twelve, Fourteen, Fifteen, Sixteen, Seventeen, Twenty, Twenty-one, Twenty-two, Twenty-three, Twenty-four, Twenty-five, Twenty-seven, Twenty-eight, Twenty-nine, Forty-one, and Forty-eight, and toward the construction of Locks and Dams Numbered Seven, Nine, Ten, Twelve, Nineteen, Twenty, Twenty-nine, Forty-one, and Forty-eighth: *Provided*, That so much of the sum herein appropriated as shall be necessary may be applied toward the definite location and purchase of sites for additional locks and dams on said river: *Provided further*, That the Secretary of War may enter into a contract or contracts for such materials and work as may be necessary to prosecute the said project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate three million five hundred thousand dollars, exclusive of the amounts herein and heretofore appropriated.

[River and harbor act of Feb. 27, 1911.]

Improving Ohio River: Continuing improvement by the construction of locks and dams with a view to securing a navigable depth of nine feet, two million dollars: *Provided*, That the Secretary of War may enter into a contract or contracts for such materials and work as may be necessary to prosecute the said project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate three million dollars, exclusive of the amounts herein and heretofore appropriated.

[Sundry civil act of Mar. 4, 1911.]

Improving Ohio River below Pittsburgh, Pennsylvania: For continuing improvement by the construction of Locks and Dams Numbered Seven, Nine, Ten, Twelve, Nineteen, Twenty, Twenty-nine, Forty-one, and Forty-eight, one million seven hundred and ten thousand dollars.

[River and harbor act of July 25, 1912.]

Improving Ohio River: Continuing improvement by the construction of locks and dams with a view of securing a navigable depth of nine feet, three million two hundred thousand dollars. *Provided*, That the Secretary of War may enter into a contract or contracts for such materials and work as may be necessary to prosecute the said project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate two million two hundred thousand dollars, exclusive of the amounts herein and heretofore appropriated.

[Sundry civil act of Aug. 24, 1912.]

Improving Ohio River below Pittsburgh, Pennsylvania: For continuing improvement by the construction of Locks and Dams Numbered Seven, Nine, Ten, Twelve, Nineteen, Twenty, Twenty-nine, Forty-one, and Forty-eight, one million one hundred and forty-one thousad dollars.

Work of creating slack-water navigation on the Ohio River has been in progress for many years, first with a view to securing a depth of 6 feet and afterwards a depth of 9 feet, and prior to the adoption of the new project the practical completion of 12 locks and dams and some work on two others had been provided for by special specific appropriations. Of these, Nos. 1–6, inclusive, 8, 11, 13, 18, 37, and the dam at 41 have been completed, or practically so, and Nos. 19 and 26 are well under way. Nine more locks and dams, i. e., Nos. 7, 9, 12, 14, 15, 20, 28, 29, and 48, and lock at No. 41, have been started since the adoption of the comprehensive project in 1910, and first allotments have been made for Nos. 10, 31, and 43. The lock and dam at No. 41, Louisville, are separate structures, being at opposite ends of the Louisville & Portland Canal, the cost of widening the canal being included in cost of Lock No. 41.

Land has been purchased, or is being purchased, for all sites of locks and dams. In the Pittsburgh and Wheeling districts practically all land has been purchased. In the Cincinnati and Louisville districts all land needed in the near future has been purchased and the remaining land is being purchased as rapidly as consistent with the best interests of the Government.

The new project contemplates a total of 54 locks and dams. The report of the approved project, House Document No. 492, Sixtieth Congress, first session, gives the original estimate for these locks and dams, made in 1906, amounting to $63,731,488, in addition to appropriations previously made. The report contemplates that certain dams should first be built below important cities and tributaries, and then serially in order downstream. As indicated above, there are 26 locks and dams already completed or partly provided for under appropriations made hitherto, leaving 28 to be begun under future appropriations.

The appropriations for slack-water on the Ohio River have amounted to $16,555,225.48 for work authorized prior to the adoption of the new project, and $9,201,000 under the new project, or a total of $25,756,225.48. The total expenditures for slack-water prior to June 30, 1912, were $18,937,837.32. There is an unappropriated contract authorization amounting to $5,849,000.

The execution of surveys, preparation of plans for the locks and dams, and other matters pertaining to the improvement as a whole are made the subject for consideration by a special board of officers of the Corps of Engineers, constituted at the present time as follows: Lieut. Col. Henry C. Newcomer, Lieut. Col. Francis R. Shunk, Lieut. Col. Henry Jervey, Maj. John C. Oakes, Maj. Frederick W. Altstaetter, Capt. W. A. Mitchell, recorder.

Upon the recommendation of the board, the following allotments have been made of the cash appropriations provided under the new project:

Dam No.	River and harbor act of June 25, 1910.	River and harbor act of Feb. 27, 1911.	Sundry civil act of Mar. 4, 1911.	River and harbor act of July 25, 1912.	Sundry civil act of Aug. 24, 1912.
7	$150,000		$250,000	$150,000	$122,000
9	150,000		400,000	150,000	282,000
10	40,000			470,000	
12	150,000		300,000		
14		$330,000		100,000	
15		305,000		150,000	
19	220,000		300,000	100,000	
20	40,000	248,000			167,000
28		250,000		300,000	
29	150,000	52,000	460,000		
31				330,000	
41	50,000	300,000		420,000	570,000
43				550,000	
48	50,000	435,000			
Movable parts				230,000	
Surveys, etc.	150,000	80,000		250,000	
Total	1,150,000	2,000,000	1,710,000	3,200,000	1,141,000

The actual construction of the new locks and dams and the operation and care of the completed structures are under the immediate supervision and direction of the district engineer officers at Pittsburgh, Wheeling, Cincinnati, and Louisville. Details of the work of the past year and of proposed future operations may be found in other parts of this report, as follows: Locks and Dams Nos. 1 to 10, on pages 899 to 905; Locks and Dams Nos. 11 to 28, on pages 909 to 915; Locks and Dams Nos. 29 to 40, on pages 886 to 889; and Locks and Dams Nos. 41 to 54, on pages 929 to 939.

In adopting the 9-foot project for the Ohio River and river and harbor act of June 25, 1910, specified that the work should be prosecuted "with a view to the completion of such improvement within a period of 12 years." Inasmuch as it requires from 3 to 4 years to complete one lock and dam on the upper river and even a longer time to complete one on the lower river where the greater portion of the work not yet begun is located, it is apparent that in order to comply with the requirement that the whole improvement shall be completed within a period of 12 years from the date of its commencement, provision will have to be made for beginning construction of all structures several years in advance of the date fixed for completion. There are 28 dams of the 54 to be built on the river which have not yet been commenced. If the system is to be completed by 1922, i. e., 12 years from 1910, the date of the act specifying the period for completion, construction of all of these dams must be begun by 1917. This involves the commencement of construction of at least six dams during each year between 1913 and 1917, inclusive, and necessitates the provision of funds in sufficient amount to permit of such commencement in addition to the amount needed to continue construction of dams whose construction had been previously commenced. After the next few years, when the improvement is well under way, the annual necessities will naturally decrease as the system approaches completion, but for a few years these annual necessities will be greater than one-twelfth of the total cost in order to get the work well started and to make up for past deficiencies in appropriations.

The funds provided during the past year for the Ohio River being less than the average amount needed, those to be provided this year should be correspondingly greater.

With the above facts in mind the following estimates for fiscal year 1914 are submitted:

To cover obligations in connection with work on the 13 locks and dams *which have already been commenced and which are to be completed under continuing contract authorizations contained in previous acts*, the sum of $5,000,000 is asked for for continuation of the works to be appropriated in the sundry civil act for the fiscal year 1914.

To meet the expenses of operations during the next fiscal year at the two other localities where work *will be done by hired labor* with Government plant on locks and dams now authorized, and the expenses at other sites *where work should be commenced in the near future by contract* or otherwise, an estimate of $7,000,000 is submitted as the amount required to be appropriated in the next river and harbor act. Since the construction of a lock and dam will require at least four years, it is not necessary that all of this latter amount be made immediately available, provided the remainder be covered by a continuing-contract authorization, as this will permit additional contracts to be made for those locks and dams for which only partial provision has heretofore been made, and enable as many additional locks and dams to be commenced under contract during the next fiscal year as may be required to carry out the program of completion announced by Congress.

There will be certain small unexpended balances of appropriations, and contract authorizations heretofore made for special dams, remaining after their completion, and it is recommended that a general authorization be given for the use of these balances in work of the general project of improvement by locks and dams.

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.

Section 3 of the river and harbor act of June 13, 1902, provided for the organization in the Office of the Chief of Engineers, by detail from time to time from the Corps of Engineers, of a board of five engineer officers, whose duties shall be fixed by the Chief of Engineers, and to whom shall be referred for consideration and recommendation, in addition to any other duties assigned, so far as in the opinion of the Chief of Engineers may be necessary, all reports upon examinations and surveys provided for by Congress, and all projects or changes in projects for works of river and harbor improvements theretofore or thereafter provided for. It is further the duty of the board, upon request to the Chief of Engineers by the Committee on Commerce of the Senate or the Committee on Rivers and Harbors of the House of Representatives, in the same manner to examine and report through the Chief of Engineers upon any projects heretofore adopted by the Government or upon which appropriations have been made and to report upon the desirability of continuing the same or upon any modifications thereof which may be deemed desirable. This provision of the law was extended by act of March 3, 1905, to require the board, upon request of the committees of Congress specified above, to examine and review surveys as well as projects provided for by acts or resolutions prior to the river and harbor act of June 13, 1902, and it was further modified by the act of March 2, 1907, to include consideration of any examination or survey made pursuant to any act or resolution of Congress.

Section 13 of the act of March 3, 1909, increased the scope of preliminary examinations and surveys by providing that every report therein ordered shall contain such data as it may be practicable to secure regarding (first) the establishment of terminal and transfer facilities, (second) the development and utilization of water power for industrial and commercial purposes, and (third) such other subjects as may be properly connected with such project. It further provided that the investigation and study of these questions may, upon review by the board, "when called for as now provided by law, be extended to any work of improvement now under way and to any locality the examination and survey of which has heretofore been, or may hereafter be, authorized by Congress." Section 6 of the same act requires the board to pass upon all modifications in plan and location involved in the reconstruction of any lock, canal, canalized river, or other work for the use and benefit of navigation, for which expenditures are authorized by that section.

The provisions relating to terminal and transfer facilities, water power, etc., were renewed in the act of June 25, 1910, and extended to apply to all examination and survey reports hereafter provided for.

During the past fiscal year the board was composed of the following officers of the Corps of Engineers: Col. William T. Rossell; Col. Solomon W. Roessler, to November 10, 1911; Lieut. Col. William C. Langfitt; Lieut. Col. Harry Taylor, from June 26, 1912; Lieut. Col. Henry C. Newcomer, from November 10, 1911; Maj. Herbert Deakyne, to June 26, 1912; Maj. William J. Barden.

Under the provisions of the acts of March 3, 1909, June 25, 1910, and February 27, 1911, all reports submitted in compliance with those acts during the year have been referred to the board for consideration and recommendation. In addition a number of subjects have been presented to it for report in accordance with resolutions of the Committee on Rivers and Harbors of the House of Representatives and the Committee on Commerce of the Senate. The reports rendered by the board from time to time in response to legislative action have been duly presented to Congress. During the year the board also gave consideration to a number of other matters referred to it by the Chief of Engineers, United States Army, for its views and recommendations.

The work accomplished by the board during the year and the status of its operations from its organization up to the close of the fiscal year are shown by the following table:

Authority for investigation.	Number of investigations ordered.	Number completed during year ending June 30, 1912.	Total number completed prior to June 30, 1912.	Number remaining to be completed.
Act of June 13, 1902	170		170	
Act of Mar. 3, 1905	176		176	
Act of June 28, 1906	1		1	
Act of Mar. 2, 1907	200		200	
Act of May 28, 1908	1		1	
Act of Mar. 3, 1909	274	18	263	11
Act of June 25, 1910	187	64	169	18
Act of Feb. 27, 1911	90	67	69	21
Resolutions of congressional committees	102	5	97	5
Concurrent resolution of Congress	1	1	1	
Miscellaneous cases referred by the Chief of Engineers, United States Army	41	6	40	1
Total	1,243	161	1,187	56

Number of public hearings held and inspections made during the year	13
Number of hearings to Members of Congress and other interested persons given at the office of the board during the year	68
Expenses of the board during the year	$20,061.15
Estimated cost of projects recommended by the board from its organization up to June 30, 1912	$272,227,798.96
Estimated cost of projects adopted by Congress	$213.824.437.79

Details of the operations of the board during the fiscal year will be found in Appendix Y Y.

STATEMENT OF FLOATING PLANT, INCLUDING DREDGING OPERATIONS.

For a statement of the operations of dredging plants owned by the United States for the fiscal year ending June 30, 1912, together with a complete list of the floating plant owned and operated by the Engineer Department, attention is invited to Appendix Z Z of this report.

EXAMINATIONS, SURVEYS, AND CONTINGENCIES OF RIVERS AND HARBORS.

For examinations, surveys, and contingencies, and for incidental repairs for rivers and harbors, for which there may be no special appropriation, an appropriation of $250,000 should be made.

SUPERVISION OF THE HARBOR OF NEW YORK.

From July 1, 1911, to January 16, 1912, the duties of supervisor of the harbor were performed by Capt. C. McR. Winslow, United States Navy, and from January 17, 1912, to June 30, 1912, by Commander J. F. Carter, United States Navy.

The office of supervisor of the harbor of New York was created by act of Congress approved June 29, 1888, entitled "An act to prevent obstructive and injurious deposits within the harbor and adjacent waters of New York City, by dumping or otherwise, and to punish and prevent such offenses." This act was amended by section 3 of the act of August 18, 1894, entitled "An act making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes," by which amendment the functions and powers of the officer were greatly enlarged. Additional duties were also conferred on the supervisor by section 2 of the last-named act. The functions and powers of the supervisor were further extended by section 8 of act of Congress approved May 28, 1908, entitled "An act to amend the laws relating to navigation, and for other purposes."

Under the provisions of section 5 of the act of June 29, 1888, a line officer of the Navy is designated to discharge the duties created by the act, under the direction of the Secretary of War. On May 23, 1889, the Secretary of War directed that all communications in connection with these duties should be addressed to him through this office, and on February 1, 1890, he further directed that the powers conferred upon him by the act should be exercised through the Chief of Engineers.

Estimates for the fiscal year ending June 30, 1914.—The estimates of funds required for this service for the fiscal year ending June 30, 1914, are as follows:

Detailed objects of expenditure.	Estimated amount that will be required for each object.	Amount appropriated for fiscal year ending June 30, 1913.
For pay of inspectors, deputy inspectors, crews, and office force, and for maintenance of patrol fleet and expenses of office	$85,260	$85,260
For purchase or construction of 1 patrol vessel	65,000	....
For rent of office	3,000	....
Total	153,260	85,260

The appropriation for the supervision of the harbor of New York made by the sundry civil act approved August 24, 1912, was in two items, one of which provided for the pay of inspectors, deputy inspectors, office force, and the expenses of the office, and the other for the pay of crews and the maintenance of the patrol fleet. This use of two items to provide for one and the same work appears to have originated in this particular instance with the appropriation made by the act approved August 30, 1890, which introduced a specific provision for the pay of crew and the maintenance of the one patrol boat which had been obtained up to the time when the estimate was submitted on which that appropriation was based. Subsequent appropriations introduced items providing, by the name of the boat, for the pay of crew and for the maintenance of other boats as they were added to the patrol fleet. That practice continued until the act approved June 11, 1896, when the different items were consolidated in two items similar in form to those found in the act approved August 24, 1912. There appears to be no good reason for continuing the practice, which seems to have no other result than to increase bookkeeping and clerical labor. The money is all expended under one direction for one purpose. Some of the inspectors also serve as masters or mates of the patrol boats, and no reason is perceived for providing for their pay in one item and for that of the other members of the crew in another.

As the rooms in the Army Building now occupied by the supervisor of New York Harbor are desired exclusively for military purposes, it may be necessary for him to vacate them. It has thus far been found impracticable to secure the necessary office room in any building owned by the Government, and quarters will have to be rented elsewhere. As the appropriations for the work of the supervisor are limited and specific in character and do not include the cost of office rent, an estimate of $3,000 is submitted as necessary for rental of suitable office space during the fiscal year 1914.

The necessity for the purchase or construction of an additional patrol vessel is presented at length in the annual report of the supervisor of New York Harbor for the fiscal year ending June 30, 1911 (p. 2919 of the Annual Report of the Chief of Engineers for 1911), and also in a note printed on page 396 of the Digest of Estimates of Appropriations, 1913. Under the plan of supervision described on pages 2916, 2918, and 2919 of the Annual Report of the Chief of Engineers for 1911, four boats maintain a continuous patrol, night and day, of the bay and harbor extending to 5 miles outside the Scotland and Ambrose light vessels; two other boats patrol the water fronts of the harbor and its tributaries. A seventh boat was utilized as a substitute for boats of the permanent patrol while under repair, but during the last fiscal year the substitute boat, which was old, became so unseaworthy, as a result of a slight collision, that it was no longer safe for patrol duty, even inside the harbor. As repairs would have been a waste of money, it was condemned and sold. It is reported that another vessel of the patrol fleet, the *Nimrod*, a wooden vessel, built in 1890, can not last much longer, on account of the deterioration of the hull and the worn condition of the machinery. The number of vessels is now insufficient to permit a proper policing of

Hudson River and Long Island Sound, and experience has shown that any relaxation of a strict patrol at the mouth of the harbor, by the withdrawal of a vessel for repairs, is sure to result in injury to the channels by illegal dumping.

The boat to be employed for this service ought to be seaworthy in every respect and able to perform duty outside the lightship in all conditions of weather. The sum of $65,000 is deemed essential to obtain a vessel of the character required.

The report of Commander Carter for the past fiscal year is submitted herewith as Appendix AAA.

CALIFORNIA DÉBRIS COMMISSION.

Unrestricted mining by the hydraulic process in California resulted in enormous quantities of débris being washed down into the rivers and natural watercourses draining the western slopes of the Sierras. Later on hydraulic mining was practically prohibited by the decisions of the courts on account of injury to streams and the adjacent private land.

The act of Congress approved March 1, 1893, created the California Débris Commission and provided that the commission should consist of three officers of the Corps of Engineers, appointed by the President, with the concurrence of the Senate. The same act prescribed the duties of the commission, which are, first, the regulation of hydraulic mining in the territory drained by the Sacramento and San Joaquin River systems (shown on map opposite p. 2492, part 3, of the Annual Report of the Chief of Engineers, United States Army, for 1881) so that mining by that method may be resumed and carried on without injury to other interests in the State; and, second, to mature and adopt plans to improve the navigability of the above-mentioned river systems, to protect same from damage due to mining débris, and to afford relief thereto in flood time.

Regulation of hydraulic mining and plans for improvement and protection of rivers and control of flood waters and mine débris.—Up to June 30, 1912, the commission received 889 applications for permits to mine by the hydraulic process under the restrictions imposed by the act of Congress of March 1, 1893, and granted permits in cases where means for properly impounding the débris were provided by the applicants.

Since its creation in 1893 the commission has made examinations and surveys of portions of the Sacramento, San Joaquin, Feather, Yuba, Bear, American, Mokelumne, and other tributaries of the Sacramento and San Joaquin Rivers and submitted plans for the storage of mine débris in Yuba River and for the control of floods and débris in the Sacramento and Feather Rivers.

Storage of mine débris in Yuba River, Cal.—The Yuba River, a tributary of the Feather, which in turn is a tributary of the Sacramento River, was the first selected for treatment, this stream being more filled with débris and carrying more detritus than all the other tributaries of the Sacramento combined. The general project for the treatment of the Yuba was printed with maps in House Document No. 431, Fifty-sixth Congress, first session, and without maps in the Annual Report of the Chief of Engineers for 1900, part 8, page 5030. The estimated total cost of this project was placed at $800,000. It was adopted by act of Congress approved June 13, 1902. The estimated total cost of the project has been appropriated—$400,000 by Congress and $400,000 by the Legislature of California—the appropriations by Congress stipulating that one-half the cost of the work should be paid by the State of California.

The Yuba River project contemplated holding the great quantities of mine débris now in that stream and tributaries to prevent it from being carried down into the Feather and Sacramento Rivers, this to be accomplished by restraining barriers, or dams, across the bed of the Yuba, by a settling basin adjoining the river on the south, and by training walls below. Later on the restraining barriers, or dams, and the settling basin were eliminated from the project and the operations confined to the construction of the training walls.

The amount expended by the United States on the project up to June 30, 1912, was $345,998.95 for works of improvement. These expenditures were principally in payment of one-half the purchase price of upward of 10,000 acres of land; in payment of one-half the cost of the construction of portions of barriers, or dams, in Yuba River, known as Nos. 1 and 2; of one-half the cost of excavating a flood-overflow channel through the promontory on Yuba River, known as Daguerre Point; of one-half the cost of constructing a portion of the proposed training walls to confine the flow of Yuba River below Daguerre Point; of one-half the cost of constructing a portion of the proposed débris-settling basin on the south side of Yuba River in the vicinity of Daguerre Point; and of one-half the cost of clearing trees and brush from the flood channel from Daguerre Point to Marysville, Cal.

The expenditures during the past fiscal year were in payment of one-half the cost of clearing trees and brush from the flood channel below Daguerre Point and making minor additions to the works built in previous years.

In a special report, dated June 30, 1907 (submitted to comply with secs. 5, 6, and 7 of the act of Congress of Mar. 1, 1893), printed in the Annual Report of the Chief of Engineers for 1907, pages 2262-2269, the commission estimated that the restraining works already constructed and remaining to be built under the present project for the treatment of Yuba River would provide capacity for storing 60,000,000 cubic yards of débris in that stream.

General project for control of débris and floods in the Sacramento and Feather Rivers.—The conditions along the Sacramento and Feather Rivers were set forth in detail in House Document No. 81. Sixty-second Congress, first session. In a preliminary report, dated June 30, 1907, printed in the Annual Report of the Chief of Engineers for 1907, pages 2262-2269, the commission stated that dredging was considered the most feasible method to meet the requirements of all the interests involved—navigation, protection from flood overflow, better drainage, and disposal and control of débris in the Sacramento and Feather Rivers—and submitted an estimate of $800,000 for beginning this work. This estimate was submitted by the commission with the provision that one-half should be appropriated by the State of California. The State of California on March 1, 1909, appropriated $400,000 for this purpose, with the stipulation that—

> SEC. 2. This act shall become operative only upon condition that the Government of the United States shall, under, by, and through the War Department, assume full charge and control of all work to be done as provided by this act, and also upon condition that a like sum of four hundred thousand dollars be appropriated by the United States for such work.

The appropriation made by the State of California also contains the provision that—

> The whole of such amounts appropriated by the Congress of the United States and by the State of California shall be expended under the direction of the Secretary of War and the supervision of the Chief of Engineers.

The river and harbor act approved June 25, 1910, appropriated $400,000 for this work, as follows:

> Improving Sacramento and Feather Rivers, California: Continuing improvement and toward the controlling of débris and floods, in accordance with the recommendations of the California Débris Commission in its report dated June thirtieth, nineteen hundred and seven (printed in the Annual Report of the Chief of Engineers, United States Army, for nineteen hundred and seven, pages twenty-two hundred and sixty-two to twenty-two hundred and sixty-nine, inclusive), four hundred thousand dollars: *Provided*, That no part of this sum shall be expended unless the State of California shall appropriate for the prosecution of said project a like sum of four hundred thousand dollars and deposit the same in the Treasury of the United States: *Provided further*, That the Treasurer of the United States is hereby authorized to receive from the State of California any and all sums of money that have been or may hereafter be appropriated by said State for the purpose herein set forth; and when so received the said sums are hereby appropriated for said purpose, to be expended under the direction of the Secretary of War and the supervision of the Chief of Engineers: *And provided further*, That the work herein provided for shall not be begun until all rights of way needed for levees and spoil banks have been furnished the United States free of cost.

In compliance with the requirements of the act of Congress, the authorities of the State of California deposited the State's appropriation of $400,000 in the Treasury of the United States on July 1, 1911.

The first work proposed to be done under this project is to afford relief from floods along the lower 16 miles of the Sacramento River.

The work of acquiring the necessary rights of way, with the view of turning the same over to the United States, is in progress, the Sacramento and San Joaquin River Improvement Association, a corporation organized for the purpose, having this matter in charge.

The amount expended on the project up to June 30, 1912, was $131,723.82, for works of improvement. These expenditures were principally for payments on the two suction dredges now under construction under contract.

The operations during the past fiscal year have consisted in making surveys and maps of the lands required, furnishing descriptions of such lands to the Sacramento and San Joaquin River Improvement Association, partially constructing two 20-inch suction dredges under contract, and preparing plans and specifications for portions of the auxiliary plant needed to operate the dredges.

The interests of navigation, the problem of flood control, and the control and disposition of mine débris in and along the Sacramento and San Joaquin Rivers and their tributaries are all inseparably connected. More extended information on these subjects may be found in the following-named executive documents and Annual Reports of the Chief of Engineers:

River.	Executive document.			Annual report for fiscal year.	Part.	Pages.
	No.	Congress.	Session.			
Sacramento				1871		914-917
Do Feather				1875	2	697-707
San Joaquin				1875	2	726-729
Sacramento				1877	2	994-996
Do Feather				1878	2	1294-1299
Sacramento Feather				1879	2	1749-1751
Sacramento				1880	3	2283-2292
Do San Joaquin and tributaries (mine débris).	H. 76	Forty-sixth	Third	1881	3	2485-2515
Sacramento San Joaquin and tributaries (mine débris.	H. 98	Forty-seventh	First	1882	3	2542-2549
Mokelumne	S. 34	do	do	1882	3	2537-2540
San Joaquin				1883	3	1976-1982
Mokelumne				1885	3	2259-2260
Yuba	H. 71	Forty-eighth	Second	1885	3	2273-2274
Sacramento San Joaquin and tributaries (mine débris).	H. 267	Fifty-first	do	1891	6	2996-3013
Sacramento Feather	H. 246	do	do	1891	5	2990-2995
Mokelumne	H. 178	do	do	1891	5	3133-3137
San Joaquin	H. 20	Fifty-second	do	1893	4	3290-3294
Do	H. 18	do	do	1893	4	3294-3297
Stanislaus	H. 19	do	do	1893	4	3301-3306
Tuolumne	H. 24	do	do	1893	4	3299-3301
Merced	H. 95	do	do	1893	4	3297-3298
Sacramento San Joaquin and tributaries (mine débris).	H. 16	Fifty-third	do	1894	6	3160-3167
American (mine débris)				1895	5	3335-3338
Feather	H. 53	Fifty-third	Third	1895	5	3325-3326
Georgiana Slough of Sacramento River	H. 72	do	do	1895	5	3328-3329
San Joaquin (old river branch)	H. 225	do	do	1895	5	3398-3399
Sacramento	H. 280	Fifty-fourth	First	1896	5	3223-3226
San Joaquin	H. 60	do	do	1896	5	3219-3223
Sacramento Feather	H. 186	Fifty-fifth	Second	1898	4	2944-2946
Sacramento Feather	H. 48	do	Third	1899	4	3171-3181
San Joaquin	H. 152	do	do	1899	4	3188-3193
Yuba (mine débris)	H. 431	Fifty-sixth	First	1900	8	5089-5099
San Joaquin	H. 261	do	Second	1901	4	3449-3453
Do	H. 69	do	do	1901	4	3454-3459
Sacramento San Joaquin and tributaries	H. 262	Fifty-ninth	First			
Sacramento San Joaquin and tributaries				1907	3	2262-2269
San Joaquin Stockton Channel	H. 1124	Sixtieth	Second			
Feather	H. 76	Sixty-first	First			
Sacramento	H. 1123	Sixtieth	Second			
Do	H. 76	Sixty-second	First			
Sacramento and tributaries	H. 81	do	do			

The members of the commission during the past fiscal year were the following officers of the Corps of Engineers, United States Army: Col. John Biddle, to August 2, 1911; Lieut. Col. Thomas H. Rees from August 15, 1911; Lieut. Col. C. H. McKinstry, from April 26, 1912; Maj. S. A. Cheney, and Capt. Charles T. Leeds, to April 26, 1912.

APPROPRIATION FOR EXPENSES OF CALIFORNIA DÉBRIS COMMISSION, 1912.

July 1, 1911, amount appropriated by act of Congress approved Mar. 4, 1911	$15,000.00
June 30, 1912, amount expended during fiscal year	[1] 10,926.16
July 1, 1912, balance unexpended	4,073.84
July 1, 1912, outstanding liabilities	756.86
July 1, 1912, balance available	3,316.98
July 1, 1912, amount rendered available for expenses in July, 1912, by joint resolution of Congress	1,250.00
Balance reverting to Treasury Aug. 1, 1912	2,066.98
Amount (estimated) required for expenses of the California Débris Commission during the fiscal year ending June 30, 1914, in regulating hydraulic mining operations in the State of California, making examinations and surveys for improvement of navigation, control and disposition of mine débris, and control of flood waters, as required by the act of Congress approved Mar .1, 1893	15,000.00

APPROPRIATION BY CONGRESS FOR RESTRAINING MINE DÉBRIS IN YUBA RIVER, CAL.

July 1, 1911, balance unexpended	$56,996.38
Amount received from sales	27,500.00
	84,496.38
June 30, 1912, amount expended during fiscal year, for works of improvement	2,245.85
July 1, 1912, balance unexpended	82,250.53

GENERAL PROJECT FOR CONTROL OF DÉBRIS AND FLOODS IN THE SACRAMENTO AND FEATHER RIVERS, CAL.

July 1, 1911, balance of United States funds unexpended	$399,144.87
July 1, 1911, amount received from State of California	400,000.00
	799,144.87
June 30, 1912, amount expended during fiscal year, for works of improvement	130,868.69
July 1, 1912, balance unexpended	668,276.18
July 1, 1912, outstanding liabilities	41,229.76
July 1, 1912, balance available	627,046.42
July 1, 1912, amount covered by uncompleted contracts	185,710.72
Amount (estimated) required to be appropriated for completion of existing project	Indeterminate.

(See Appendix B B B.)

WATERWAY FROM LOCKPORT, ILL., BY WAY OF THE DES PLAINES AND ILLINOIS RIVERS, TO THE MOUTH OF THE ILLINOIS RIVER, ETC.

Under the provisions of section 1 of the river and harbor act of June 25, 1910, a board, consisting of Brig. Gen. William H. Bixby, Chief of Engineers, United States Army; Col. C. McD. Townsend, Corps of Engineers; Maj. Charles Keller, Corps of Engineers; Maj.

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[1] In addition there was expended during the year $627.04 from appropriation for fiscal year 1911.

J. B. Cavanaugh, Corps of Engineers; and Mr. John Bogart, civil engineer, was appointed by the Secretary of War to consider and report upon the construction of a waterway from Lockport, Ill., by way of the Des Plaines and Illinois Rivers, to the mouth of the said Illinois River; the said board to report upon the feasibility of such waterway and the most advisable depth and dimensions therefor, in case the same is recommended; also upon such measures as may be required to properly preserve the levels of the Great Lakes, and to compensate, as far as practicable, for the diminished levels in said lakes and the connecting waters thereof by reason of any diversion of water from Lake Michigan, etc. The said act made an appropriation of $1,000,000, subject to the provision that "until these plans and estimates have been submitted and a project for the improvement adopted by Congress the appropriation of one million dollars herein made shall not be available for expenditure."

Reports dated November 1, 1910, and January 23, 1911, on the proposed waterway and certain related subjects called for by the said act were transmitted to Congress and printed in House Documents Nos. 1061 and 1374, Sixty-first Congress, third session, respectively. Further report on certain related subjects will be duly submitted when received.

SURVEY OF INTRACOASTAL WATERWAYS FROM BOSTON, MASS., TO THE RIO GRANDE, REQUIRED BY THE RIVER AND HARBOR ACT OF MARCH 3, 1909.

The river and harbor act of March 3, 1909, directed certain surveys to be made with a view to the construction of a continuous waterway, inland where practicable, from Boston, Mass., to the Rio Grande, which were assigned to boards of engineers.

Report dated October 4, 1911, with maps, by the special board of Engineer officers, upon the survey of that section of the proposed continuous inland waterway from Boston, Mass., to Beaufort Inlet, N. C., was duly submitted, and was reviewed by the Board of Engineers for Rivers and Harbors, pursuant to law, and its report thereon submitted December 12, 1911. These reports were transmitted to Congress and printed in House Document No. 391, Sixty-second Congress, second session. Projects and estimates for improvement of the following sections are presented:

Boston to Narragansett Bay section	$40,000,000
Narragansett Bay-Long Island Sound section	12,322,000
New York Bay-Delaware River section	45,000,000
Delaware River-Chesapeake Bay section	12,424,500
Norfolk-Beaufort Inlet section	5,400,000

Only the last two sections named above were recommended for adoption at the present time.

It is expected that the reports of the other boards on the sections between Beaufort Inlet and the Rio Grande will be transmitted to Congress during its next session.

MISSISSIPPI RIVER COMMISSION.

The Mississippi River Commission, constituted by act of Congress of June 28, 1879, is in charge of the improvement of the Mississippi River from Head of Passes to the mouth of the Ohio River, including the rectification of Red and Atchafalaya Rivers at their junction with the Mississippi, the building of levees, and the improvement of the several harbors for which specific appropriations have been made, with the exception of the harbor of Vicksburg and the mouth of Yazoo River. It is also charged with the survey of the Mississippi River from Head of Passes to its headwaters, and with gauging the river and its tributaries.

The river and harbor acts of March 3, 1905, and March 2, 1907, prescribed that the money therein appropriated and authorized to be expended should be applied to the construction of suitable and necessary dredge boats and other devices and appliances and in the maintenance and operation of the same, with the view of ultimately obtaining and maintaining a navigable channel from Cairo down not less than 250 feet in width and 9 feet in depth at all periods of the year, except when navigation is closed by ice. They also authorized allotments from such funds in the discretion of the commission and upon approval by the Chief of Engineers, to be applied to the watercourses connected with the river and the harbors upon it now under the control of the Mississippi River Commission.

Act of Congress approved June 4, 1906, provides that any funds which have been, or may hereafter be, appropriated by Congress for improving the Mississippi River between the Head of Passes and the mouth of the Ohio River, and which may be allotted to levees, may be expended under the direction of the Secretary of War, in accordance with the plans, specifications, and recommendations of the Mississippi River Commission, as approved by the Chief of Engineers, upon levees upon any part of said river between the Head of Passes and Cape Girardeau, Mo.

The appropriations under continuing contracts authorized by the act of March 2, 1907, have been completed, and further appropriations are now being made annually, that of February 27, 1911, being for $3,000.000.

Emergency appropriations have been made by Congress during the past fiscal year, for expenditure under the commission, as follows:

Act of April 3, 1912 (Public—No. 112), appropriated $350,000 for the purpose of maintaining and protecting against impending floods the levees on the Mississippi River. This act was amended by joint resolution of April 9, 1912 (Public Resolution—No. 25), so as to make the appropriation available for the purpose of maintaining and protecting against impending floods the levees on rivers tributary to the Mississippi River.

Act of April 16, 1912 (Public—No. 122), appropriated $300,000 for the purpose of maintaining and protecting against the impending flood the levees on the Mississippi River and rivers tributary thereto.

Joint resolution of April 30, 1912 (Public Resolution—No. 30), appropriated $1,500,000 for rebuilding such portions of the levees on the Mississippi River and its tributaries as may have been or may hereafter be broken by the existing flood in said rivers, or so materially weakened as to necessitate rebuilding; and provided that so much of this appropriation as might be expended should be deducted from the appropriations that shall first hereafter be made for improving the Mississippi River from Head of Passes to the mouth of the Ohio River.

The commissioners during the fiscal year were Col. C. McD. Townsend, Corps of Engineers, president from February 6, 1912; Col. William T. Rossell, Corps of Engineers, who acted as president until February 6, 1912; Col. J. G. Warren, Corps of Engineers; Homer P. Ritter, assistant, United States Coast and Geodetic Survey; Robert S. Taylor; J. A. Ockerson; and C. H. West.

Lieut. Col. Charles L. Potter, Corps of Engineers, was on duty as secretary of the commission during the fiscal year.

Estimate for the fiscal year ending June 30, 1914.—The following estimate of funds required for carrying on the works under charge of the Mississippi River Commission for the year ending June 30, 1914, is submitted:

For continuing the improvement of Mississippi River from Head of Passes to the mouth of the Ohio River, including salaries and clerical, office, traveling, and miscellaneous expenses of the Mississippi River Commission	$6,000.000

The report of the commission on the operations under its charge during the fiscal year ending June 30, 1912, is submitted herewith as Appendix M M M of this report.

EXPERIMENTAL TOWBOATS FOR MISSISSIPPI RIVER AND ITS TRIBUTARIES.

Under the provisions of section 1 of the river and harbor act approved June 25, 1910, a board, consisting of Lieut. Col. Lansing H. Beach, Corps of Engineers; Lieut. Col. Henry C. Newcomer, Corps of Engineers; Lieut. Col. Charles L. Potter, Corps of Engineers; and Maj. Charles Keller, Corps of Engineers, was appointed by paragraph 2 of Special Orders, No. 38, Office, Chief of Engineers, August 2, 1910, " for the purpose of making investigations and designing and constructing two experimental towboats of modern but different types for use on the Mississippi River and its tributaries," etc.

The board has made thorough investigations into the most desirable types of towboats and barges for use on nontidal rivers, and has considered necessary loading and unloading facilities, and the work assigned is well advanced. During the summer of 1911 a committee of the board visited Europe for the purpose of observing contemporaneous European practice. The questions of the comparative value and economy of the use of radial and feathering wheels and of coal and oil as fuel are receiving attention. The use of steel barges of two different types is being favorably considered. The recommendations of the board as to desirable types of boats and barges, with tentative sketch plans and estimates of cost of constructing same, are being prepared.

June 25, 1910, amount appropriated	$500,000.00
Amount expended to June 30, 1911	4,799.92
July 1, 1911, balance unexpended	495,200.08
June 30, 1912, amount expended during fiscal year	7,470.34
July 1, 1912, balance unexpended	487,729.74
July 1, 1912, outstanding liabilities	442.33
July 1, 1912, balance available	487,287.41

PERMANENT INTERNATIONAL COMMISSION OF THE CONGRESSES OF NAVIGATION.

By act approved June 28, 1902, Congress appropriated the sum of $3,000 per year for the support and maintenance of the Permanent International Commission of the Congresses of Navigation and for the payment of the actual expenses of the properly accredited national delegates of the United States to the meeting of the congresses and of the commission.

At the beginning of the fiscal year the United States was represented on the Permanent International Commission of the Congresses of Navigation by Brig. Gen. C. W. Raymond, United States Army, retired; Brig Gen. W. H. Bixby, Chief of Engineers, United States Army; Col. Harry F. Hodges, Corps of Engineers, United States Army; Lieut. Col. J. C. Sanford, Corps of Engineers, United States Army; Mr. Elmer L. Corthell; Mr. John Bogart; Hon. J. Hampton Moore, Member of Congress. The representation on the commission has remained unchanged during the year.

A meeting of the commission, composed of two sessions, was held at Philadelphia, Pa., on May 22, 1912. At this meeting the United States was represented by Gen. Bixby, Lieut. Col. Sanford, Mr. Corthell, Mr. Bogart, and Mr. Moore.

The Twelfth International Congress of Navigation was held at Philadelphia, Pa., May 23–28, 1912. The following delegates representing the United States had been appointed to this congress:

MEMBERS OF AMERICAN SECTION OF PERMANENT COMMISSION.

Brig. Gen. Charles W. Raymond, United States Army, retired, chairman; Brig. Gen. W. H. Bixby, Chief of Engineers, United States Army; Lieut Col. J. C. Sanford, Corps of Engineers, United States Army; Mr. Elmer L. Corthell, civil and consulting engineer; Mr. John Bogart, civil and consulting engineer; Hon. J. Hampton Moore, Member of Congress.

UNITED STATES DELEGATES.

Representing the Treasury Department, Capt. P. U. Eberroth, Revenue-Cutter Service; representing the War Department, the Quartermaster General, United States Army; representing the Navy Department, Civil Engineer Leonard M. Cox, United States Navy; representing the Interior Department, Mr. M. O. Leighton, chief hydrographer, United States Geological Survey; representing the Department of Commerce and Labor, Mr. Homer P. Ritter, United States Coast and Geodetic Survey, also member of the Mississippi River Commission; representing American Society of Civil Engineers, Mr. J. A. Ockerson, president of the society; representing Isthmian Canal Commission, Col. George W. Goethals, Corps of Engineers, United States Army, chairman of the commission and chief engineer, Panama Canal; representing National Waterways Commission, Hon. De Alva S. Alexander, ex-chairman Committee on Rivers and Harbors, United States House of Representatives.

GENERAL REPORTERS.

Rear Admiral Mordecai T. Endicott, United States Navy, retired; Col. Edward Burr, Corps of Engineers, United States Army; Lieut.

Col. L. H. Beach, Corps of Engineers, United States Army; Lieut. Col. Henry C. Newcomer, Corps of Engineers, United States Army; Prof. Emory R. Johnson, of University of Pennsylvania; Mr. Alfred Noble, civil and consulting engineer.

Most of these were present at the congress, but a few, including the first delegate, Gen. Raymond, who had also been appointed the first general president of the congress, were unavoidably absent.

The expenditures during the year from the above appropriation amounted to $2,557.57, and have been for the expenses of the delegates to a commission meeting, the maintenance of the office of the American section of the Permanent International Commission, and the support and maintenance of the commission, to which the United States contributes $1,000 per annum.

Under the appropriation of $50,000 contained in the river and harbor act approved June 25, 1910, for the expenses of the Twelfth Interntional Congress of Navigation, and the cost of transporting foreign members of the permanent association and authorized foreign delegates in the investigation of American waterways, the following work was done:

The Philadelphia office, which had been opened in December, 1910, was maintained throughout the year.

The work done prior to the congress consisted in the preparation and distribution of circulars, illustrated publications, and monthly bulletins regarding the congress, for the purpose of creating interest in the congress among foreign and American members of the association, in the preparation and sending out of news matter for publication in the United States and abroad, in the distribution to American members of technical papers written for the congress and translated and printed in Brussels, and in the furnishing of congress credentials to delegates regarding whose appointment notification was received and to members who stated that they expected to attend.

Just before the congress the office was temporarily moved to the Bellevue-Stratford Hotel, where the congress was to be held, and was maintained there during the time of meeting.

Since the congress the work of the office has consisted of settling accounts and preparation of report of proceedings on trips connected with the congress. After the close of the congress proper the foreign members and delegates were taken on extended trips, as contemplated by the act. On one of these trips they were taken from Philadelphia to Pittsburgh via Washington and Harrisburg and return to Philadelphia. On another, from Philadelphia to Chicago via New York, Albany, New York State Barge Canal, Buffalo, Niagara Falls, Cleveland, Detroit, Sault Ste. Marie, Milwaukee, and Gary. From New York to Albany on this trip a portion of the members followed the Hudson River route, while a portion proceeded via the Cape Cod Canal and Boston. At Sault Ste. Marie a considerable number left the above-stated route and proceeded to Quebec under an invitation extended by the Government of Canada. Those who proceeded to Chicago arrived there on the afternoon of June 14, while those who went to Quebec arrived there on the evening of June 18. These trips were made particularly agreeable and interesting by the energetic efforts and liberal financial help of the localities visited, which amply provided entertainments, interesting short trips in the vicinity, etc.

To assist in entertaining members during the congress and on the excursions in the vicinity of Philadelphia and in the State of Pennsylvania, the State of Pennsylvania had appropriated $25,000 and the city of Philadelphia $50,000. The State of New Jersey also had appropriated $5,000, and at various cities visited considerable sums had been appropriated by the city governments or raised by private subscriptions for the entertainment of the party.

The expenditures during the year from the appropriation of June 25, 1910, amounted to $13,713.43, and have been for maintenance of Philadelphia office, printing, postage, travel expenses, and sundry expenses connected with the congress and the trips given the members.

ESTABLISHMENT OF HARBOR LINES.

Under authority given to the Secretary of War in section 11 of the river and harbor act approved March 3, 1899, harbor lines have been established during the past fiscal year at the following localities, under dates as indicated:

Newtown Creek at Metropolitan Avenue, Borough of Queens, N. Y., modification of harbor line, approved July 11, 1911; Monongahela River, modification of lines shown on sheet 14, extending from the mouth to a point just above the Pittsburgh, Cincinnati, Chicago & St. Louis Railroad bridge at Try Street, and modifications of harbor line on left bank, between South Sixth and South Ninth Streets, and at Dam No. 1, Pittsburgh, Pa., approved August 21, 1911; Kenosha Harbor, Wis., revision and extension of harbor lines, approved August 23, 1911; Bronx River, N. Y., lower part, harbor lines approved September 23, 1911; Niagara River, at Tonawanda, N. Y., modification of harbor line, approved September 25, 1911; Arthur Kill or Staten Island Sound, N. Y. and N. J., revision of harbor lines throughout the sound from Raritan Bay to Newark Bay, approved September 28, 1911; Fox River, at Oshkosh, Wis., extension and reestablishment, approved November 25, 1911; San Diego, Cal., revision of harbor lines, approved February 5, 1912; Jones Creek, near Hampton, Va., extension of harbor lines, approved February 16, 1912; Arthur Kill, N. J., near Tufts Point, modification of pierhead line on west side of Arthur Kill, approved February 29, 1912; Bellingham Bay, Wash., modification of harbor lines, approved February 29, 1912; Pearl Harbor, Hawaii, harbor lines, approved March 8, 1912; Gravesend Bay, N. Y., modification of harbor lines, approved May 21, 1912; Hillsboro Bay, Fla. (estuary), harbor lines, approved May 24, 1912; Pot Cove, left bank East River, near Astoria, N. Y., modification of pierhead and bulkhead line, approved June 15, 1912; East Chester and Givans Creek, New York, N. Y., pierhead and bulkhead lines, approved June 19, 1912; Bronx River, between the New West Chester bridge and the New York, New Haven & Hartford Railroad bridge, in front of property of The P. J. Heany Co., modification of harbor line, approved June 22, 1912.

ABROGATION OF HARBOR LINES.

"Hell Gate" passage, East River, N. Y., about Great and Little Mill Rocks, pierhead and bulkhead lines established March 9, 1892, were abrogated by War Department action of October 24, 1911.

RULES AND REGULATIONS GOVERNING THE NAVIGATION OF CANALS, ETC.

Section 4 of the river and harbor act of August 18, 1894, as amended by section 11 of the river and harbor act of June 13, 1902, delegates to the Secretary of War the duty of prescribing such rules and regulations for the use, administration, and navigation of any or all canals and similar works of navigation that now are or that hereafter may be owned, operated, or maintained by the United States as in his judgment the public necessity may require; and he is also authorized to prescribe regulations to govern the speed and movement of vessels and other water craft in any public navigable channel which has been improved under authority of Congress whenever in his judgment such regulations are necessary to protect such improved channels from injury or to prevent interference with the operations of the United States in improving navigable waters or injury to any plant that may be employed in such operations. Such rules and regulations have been established during the past year for the following-named localities:

Galveston Channel, Tex., approved August 18, 1911; Tennessee River, Colbert Shoals Canal, Tenn., approvel October 5, 1911; Cape Fear River, N. C., at and below Wilmington (paragraphs 4 and 5 amended) September 21, 1911; Pascagoula River, Miss., use of dredged ship channel, approved November 1, 1911; Chesapeake Bay, York Spit Channel, approved February 1, 1912; Ohio River, locks and dams (except No. 41, Louisville and Portland Canal), approved April 20, 1912; Black Rock Channel across Strawberry Island Reef in Niagara River, N. Y., approved June 15, 1912; Mississippi River, south of New Orleans, La., approved April 6, 1912; Bayou Plaquemine, Grand River between the mouth of Bayou Grossetete and mouth of Bayou Sorrel, speed limit 6 miles per hour, approved April 17, 1912.

RULES AND REGULATIONS GOVERNING THE OPENING OF DRAWBRIDGES.

Section 5 of the river and harbor act of August 18, 1894, provides that it shall be the duty of all persons owning, operating, and tending the drawbridges then built or which might thereafter be built across the navigable rivers and other waters of the United States to open or cause to be opened the draws of such bridges, under such rules and regulations as in the opinion of the Secretary of War the public interests require, for the passage of vessels and other water craft. Such rules and regulations have been established during the past year by the Secretary of War for certin drawbridges over the following-named waterways:

Charlevoix Harbor, foot of Pine Lake, Mich.; highway bridge across the lower channel and the railway bridge across the upper channel, Miami River, Fla., at Miami, Fla.

RULES AND REGULATIONS FOR THE NAVIGATION OF STREAMS ON WHICH THE FLOATING OF LOOSE TIMBER AND SACK RAFTS OF TIMBER AND LOGS IS THE PRINCIPAL METHOD OF NAVIGATION.

Under the provisions of act of Congress approved May 9, 1900, "An act authorizing the Secretary of War to make regulations governing the running of loose logs, steamboats, and rafts on certain rivers and streams," the Secretary of War has prescribed no rules and regulations for such navigation on any stream during the fiscal year ending June 30, 1912.

STRUCTURES IN THE NAVIGABLE WATERS OF PORTO RICO.

Act of Congress approved June 11, 1906, empowered the Secretary of War, under certain restrictions, to authorize the construction, extension, and maintenance of wharves, piers, and other structures on lands underlying harbor areas and navigable streams and bodies of water in or surrounding Porto Rico and the islands adjacent thereto.

Through a conference between the district officer and the governor of Porto Rico a definite policy has been established and is followed in connection with applications for privileges under this law, several applications having been acted on during the year.

BRIDGING NAVIGABLE WATERS OF THE UNITED STATES.

Plans and maps of locations of the following bridges proposed to be erected under the authority of special acts of Congress have been examined with a view to protection of the interests of navigation and have been approved by the Secretary of War, as provided by the acts, and the local engineer officers have been furnished copies of the instruments of approval and drawings showing the plans and locations and charged with the supervision of the construction of the bridges, so far as necessary to see that they are built in accordance with the approved plans.

Bridge of the supervisors of Ittawamba County, Miss., across Tombigbee River, near Ironwood Bluff, Miss.—The construction of a bridge at this place was authorized by an act of Congress approved February 4, 1911. Plans and map of location were approved July 13, 1911.

Bridge of the Norfolk & Western Railway Co., across the Ohio River at Kenova, W. Va.—The construction of bridges over Ohio River is authorized by act of Congress approved December 17, 1872, as amended by act approved February 14, 1883. Plans for the reconstruction of the superstructure of an existing bridge at this point were approved July 18, 1911.

Bridge of the County of Hamilton, Tenn., across the Tennessee River at Douglas Street, Chattanooga, Tenn.—The construction of a bridge at this point was authorized by an act of Congress approved February 15, 1911. Plans and map of location were approved July 31, 1911.

Bridge of the County of Hamilton, Tenn., across the Tennessee River at a point between West Sixth and Nineteenth Streets, Chattanooga, Tenn., in the County of Hamilton, Tenn.—The construction of a bridge at this point was authorized by an act of Congress approved February 15, 1911. Plans and map of location were approved July 31, 1911.

Bridge of H. L. North, W. E. Webster, and H. J. Anderson, across the St. Croix River, at Hudson, Wis.—The construction of a bridge at this point was authorized by an act of Congress approved February 18, 1911. Plans and map of location were approved August 17, 1911.

Bridge of the Snake River Bridge Commission over Snake River, at Payette, Idaho.—The construction of a bridge at this point was authorized by an act of Congress approved March 4, 1911. Plans and map of location were approved August 25, 1911.

Bridge of the St. Louis, Iron Mountain & Southern Railway Co. over St. Francis River, Ark., on a line of its road from West Memphis to Marianna.—The construction of a bridge at this place was authorized by an act of Congress approved August 15, 1911. Plans and map of location were approved September 1, 1911.

Bridge of the Wisconsin Central Railway Co., across the St. Croix River, at a point suitable to the interests of navigation, from a point on the east bank of said river in the vicinity of the township line between townships 30 and 31 north, in St. Croix County, Wis., to a point on the west bank of said river in the vicinity of the township line between said townships 30 and 31 north, in Washington County. Minn.—The construction of a bridge at this point was authorized by an act of Congress approved March 12, 1910, and reenacted and revived by act approved August 17, 1911. Plans and map of location were approved September 9, 1911.

Bridge of the Minneapolis, St. Paul, & Sault Ste. Marie Railway Co. over St. Croix River, between Burnett County, Wis., and Pine County, Minn.—The construction of a bridge at this place was authorized by an act of Congress approved August 10, 1911. Plans and map of location were approved September 14, 1911.

Bridge of the Idaho & Washington Northern Railway Co. across the Pend Oreille River, near Box Canyon, in Stevens County, Wash.—The maintenance and operation of an already constructed bridge at this place were authorized by act of Congress approved August 16, 1911. Plans and map of location were approved October 3, 1911.

Bridge of the Chicago, Burlington & Quincy Railroad Co. across the Missouri River at Kansas City, Mo.—The construction of a bridge at this place was authorized by an act of Congress approved July 25, 1866. Plans for the reconstruction of the bridge were approved October 5, 1911.

Bridge of the Monongahela Railroad Co. across Monongahela River, between Fayette and Greene Counties, near Geneva, Pa.—The construction of a bridge at this place was authorized by an act of Congress approved May 3, 1911, modified plans were approved May 31, 1911, and further modified plans were approved October 7, 1911. The plans approved May 3 and May 31, 1911, have been canceled.

Bridge of the Southern Railway Co. in Mississippi, successors to the Georgia Pacific Railroad Co., across Sunflower River, near Baird Station, Miss.—The construction of a bridge at this place was authorized by an act of Congress approved March 3, 1887. Plans and map of location of said bridge were approved October 9, 1911.

Bridge of the Yazoo & Mississippi Valley Railroad Co. over Tallahatchie River, near Philipp, Miss.—The construction of a bridge at this place was authorized by an act of Congress approved May 28, 1896. Plans and map of location were approved June 1, 1897, and plans for the reconstruction of said bridge were approved October 24, 1911.

Bridge of the Navy Department over Back Channel of the Piscataqua River at the United States navy yard, between Portsmouth, N. H., and Kittery, Me.—The construction of a bridge at this point was authorized by an item in the naval appropriation act approved March 4, 1911. Plans and map of location were approved October 30, 1911.

Bridge of the Atlantic Coast Line Railroad Co. over Chattahoochee River at Alaga, Ala.—The construction of a bridge at this place was authorized by an act of Congress approved August 6, 1888. Plans for the reconstruction of the bridge were approved May 24, 1911, and new plans approved October 31, 1911.

Bridge of Ouachita County, Ark., across Ouachita River at Camden, Ark.—The construction of a bridge at this point was authorized by an act of Congress approved March 2, 1911. Plans and map of location were approved November 24, 1911.

Bridge of the town of Blackberry, Minn., across the Mississippi River at Blackberry, Minn.—The construction of a bridge at this place was authorized by an act of Congress approved February 15, 1911. Plans and map of location were approved January 29, 1912.

Bridge of the Aransas Harbor Terminal Railway across Morris and Cummings Channel near Stedman Island, Tex.—The construction of a bridge at this point was authorized by act of Congress approved January 22, 1912. Plans and map of location were approved February 9, 1912.

Bridge of the State of Connecticut, acting through the East Haddam and Haddam Bridge Commission, across the Connecticut River between the towns of East Haddam and Haddam, Conn.—The construction of a bridge at this place was authorized by act of Congress approved January 25, 1912. Plans and map of location were approved March 4, 1912.

Bridge of the Atchison, Topeka & Santa Fe Railway Co. across the Missouri River at or near Sibley, Mo.—The reconstruction of a bridge at this point was authorized by act of Congress approved January 22, 1912. Plans were approved March 8, 1912.

Bridge of the city of Minneapolis across the Mississippi River (in the city of Minneapolis extending from Washington Avenue north near its intersection with Lyndale Avenue north and Forty-second Avenue to the intersection of Thirty-seventh Avenue northeast) at Forty-second Avenue, Minneapolis, Minn.—The construction of this bridge was authorized by act of Congress approved January 27, 1912. Plans and map of location were approved March 13, 1912.

Bridge of the Board of County Commissioners of Lincoln County, Mont., across the Kootenai River near Rexford, Mont.—The construction of this bridge was authorized by act of Congress approved March 4, 1912. Plans and map of location were approved March 15, 1912.

Bridge of the Board of County Commissioners of Lincoln County, Mont., across the Kootenai River near Libby, Mont.—The construction of this bridge was authorized by act of Congress approved March 4, 1912. Plans and map of location were approved March 15, 1912.

Bridge of the Board of County Commissioners of Lincoln County, Mont., across the Kootenai River near Troy, Mont.—The construction of this bridge was authorized by act of Congress approved March 4, 1912. Plans and map of location were approved March 15, 1912.

Bridge of the city of Minneapolis across the Mississippi River at Plymouth Avenue, in the city of Minneapolis, Minn.—The construction of this bridge was authorized by act of Congress approved

January 27, 1912. Plans and map of location were approved March 15, 1912.

Bridge of the Lewisburg & Northern Railroad Co. across Cumberland River between Maplewood, Tenn., and Overtons, Tenn., near the city of Nashville, Tenn.—The construction of a bridge at this place was authorized by act of Congress approved February 9, 1912. Plans and map of location were approved March 20, 1912.

Bridge of the town of Grand Rapids, Minn., across the Mississippi River at Grand Rapids, Minn.—The construction of a bridge at this point was authorized by act of Congress approved March 23, 1912. Plans and map of location were approved April 20, 1912.

Bridge of the Atlantic Coast Line Railroad Co. over Flint River at Bainbridge, Ga.—The construction of a bridge at this point was authorized by an act of Congress approved August 6, 1888. Plans for the reconstruction of an existing bridge at this place were approved May 24, 1911, modified plans were approved October 24, 1911, and a further modification approved April 24, 1912.

Bridge of the Metropolitan Park Commission, Commonwealth of Massachusetts, across Charles River (locally known as the Stadium Bridge) between Boston and Cambridge, Mass.—The construction of this bridge was authorized by act of Congress approved February 27, 1911. Plans and map of location were approved April 24, 1912.

Bridge of the Chicago Great Western Railroad Co. across the Mississippi River at St. Paul, Minn.—The reconstruction of a bridge at this place was authorized by act of Congress approved February 15, 1911. Plans and map of location were approved May 24, 1911. Modified plans were approved May 17, 1912, and the instrument dated May 24, 1911, was canceled.

Bridge of the Minnesota & International Railway Co. across the Mississippi River at or near Bemidji, Minn.—The construction of this bridge was authorized by act of Congress approved March 12, 1912. Plans and map of location were approved May 27, 1912.

Bridge of the Muskogee & Fort Gibson Bridge Co. across the Arkansas River at or near Muskogee, Okla.—The construction of this bridge was authorized by act of Congress approved August 16, 1911. Plans and map of location were approved May 31, 1912.

Bridge of the Williamson & Pond Creek Railroad Co. across Tug Fork of Big Sandy River at or near Williamson, W. Va.—The construction of a bridge at this point was authorized by act of Congress approved May 11, 1912. Plans and map of location were approved June 7, 1912.

Under the provisions of section 9 of the river and harbor act approved March 3, 1899, bridges may be built over navigable waters entirely within the limits of any State, under authority of legislative enactments of such State, when the plans and locations of the structures are approved by the Secretary of War. Plans and maps of locations of the following bridges proposed to be erected under these provisions have been examined with a view to protection of the interests of navigation and have been approved by the Secretary of War, and the local engineer officers have been furnished copies of the drawings and instruments of approval and charged with the supervision of construction of the bridges, so far as necessary, to see that they are built in accordance with the approved plans.

Bridge of the city of Toledo, Ohio, across the Maumee River at Toledo, Ohio.—Plans and map of location were approved July 1, 1911.

Bridges of the Highway Department, State of Louisiana, across Bayou Chevreuil and Bay of Chevreuil, opposite Thibodeaux, La.—Plans and map of location were approved July 1, 1911.

Bridge of the Columbia, Newberry & Laurens Railroad Co., across Broad River, near Columbia, S. C.—Plans for the reconstruction of an existing bridge at this point were approved July 6, 1911.

Bridge of the Central Railroad of New Jersey, across the Hackensack River, N. J.—Plans for a temporary bridge for use during the reconstruction of an existing bridge were approved July 7, 1911.

Bridge of the Central Railroad of New Jersey, across the Passaic River, N. J.—Plans for a temporary bridge for use during the reconstruction of an existing bridge were approved July 7, 1911.

Bridge of the Lake Shore & Michigan Southern Railway Co., across Buffalo Creek, near Buffalo, N. Y.—Plans for reconstruction of an existing bridge at this point were approved July 8, 1911.

Bridge of the Summit Lumber Co., over Bayou Corney, La., near Cobb Landing, La.—Plans and map of location for a temporary bridge were approved July 8, 1911.

Bridge of the Boards of Chosen Freeholders of Hudson and Essex Counties, N. J., over Passaic River, from Bridge Street, Newark, to Harrison Avenue, Harrison, N. J.—Plans for the reconstruction of an existing bridge at this point were approved July 10, 1911.

Bridge of the city of Chicago over North Branch of Chicago River at Chicago Avenue, Chicago, Ill.—Plans for a temporary bridge for use during reconstruction of an existing bridge were approved July 10, 1911.

Bridge of the city of Boston, Mass., across Fort Point Channel at Boston, Mass. (*Northern Avenue Bridge*).—Plans for the reconstruction of an existing bridge at this point were approved July 13, 1911.

Bridge of the Shadyside Co. (*Ltd.*), *a corporation existing under the laws of the State of Louisiana, across Bayou Teche, in the Parish of St. Mary, La.*—Plans and map of location were approved July 13, 1911.

Bridge of the Great Northern Railway Co., across the Snohomish River north of Everett, Wash.—Modified plans were approved July 13, 1911. This instrument is given in lieu of the approval of October 10, 1901, covering the location and plans of a bridge proposed to be constructed by the Seattle & Montana Railroad Co. across said river at said place. The instrument of approval, dated October 10, 1901, was revoked.

Bridge of the Missouri Pacific Railway Co. over Kansas River at Kansas City, Kans.—Plans for the reconstruction of a bridge at this place were approved July 18, 1911.

Bridge of the Bay City Terminal Railway Co. (*Grand Trunk Railway System*) *across Saginaw River, at Bay City, Mich.*—Plans and map of location were approved July 19, 1911.

Bridge by the Commissioners of Hardin and Jefferson Counties, Ky., over Salt River, at West Point, Ky.—Plans and map of location were approved July 19, 1911.

Bridge of the Commissioners Court of Fort Bend County, Tex., across Brazos River, near Thompson, Tex.—Plans and map of location were approved July 20, 1911.

Bridge of the city of Boston, Mass., across Chelsea Creek, at Meridian Street, Boston, Mass.—Plans for the reconstruction of an existing bridge at this point were approved July 20, 1911.

Bridge of the Commissioners Court of Fort Bend County, Tex., across the Brazos River, near Orchard, Tex.—Plans and map of location were approved July 20, 1911.

Bridge of the Commissioners Court of Brazoria County, Tex., across the Brazos River, at Brazoria, Tex.—Plans and map of location were approved July 20, 1911.

Bridge of the Commissioners Court of Brazoria County, Tex., across the Brazos River, at Columbia, Tex.—Plans and map of location were approved July 20, 1911.

Bridge of the Oregon-Washington Railroad & Navigation Co. (successors to the Oregon & Washington Railroad Co.), across the Puyallup River, at Tacoma, Wash.—Plans and map of location were approved December 9, 1907, and modified plans July 21, 1911. The instrument dated December 9, 1907, was revoked.

Bridge by the Board of County Commissioners of Snohomish County, across the Stillaguamish River, near Norman, Wash.—Plans and map of location were approved July 26, 1911.

Bridge of the Board of Selectmen of Roque Bluffs, Me., across the Englishman River, at Roque Bluffs, Me.—Plans for the reconstruction of an existing bridge at this place were approved July 29, 1911.

Bridge by the counties of Bradley and McMinn, Tenn., over Hiwassee River, at Charleston, Tenn.—Plans and map of location were approved August 3, 1911.

Bridge by the Commissioners Court of Brazoria County, Tex., across Chocolate Bayou, near Rowanville, Tex.—Plans and map of location were approved August 4, 1911.

Bridge of the St. Louis, Peoria & Northwestern Railway Co., across the Illinois River, near Pekin, Ill.—Plans and map of location were approved August 8, 1911.

Bridge of the Port Arthur Pleasure Pier Co. across the Sabine-Neches Canal, at Port Arthur, Tex.—Plans for the reconstruction of an existing temporary bridge at this place were approved August 9, 1911.

Bridge by the Commissioners Court of Brazoria County, Tex., across San Bernardo River, at Hinkle Ferry, Tex.—Plans and map of location were approved August 14, 1911.

Bridge of the Northern Pacific Railway Co. across the waterway connecting Puget Sound with Lakes Union and Washington, city of Seattle, near the junction of Ross Place and Jesse Avenue, Wash. (crossing of the canal and occupation of Government property sanctioned by act of Congress approved Mar, 22, 1912).—Plans and map of location were approved August 16, 1911.

Bridge of the Mobile & Ohio Railroad Co. across Big Muddy River, at a point about 35 miles above its mouth, near Murphysboro, Ill.—Plans for the reconstruction of an existing bridge at this place were approved August 17, 1911.

Bridge of County Commissioners of Nassau and Duval Counties, Fla., over Nassau River, Fla., on the Duval and Fernandina Road, Fla.—Plans and map of location were approved August 17, 1911.

Bridge of the Chicago, Milwaukee & Puget Sound Railway Co., across the East Waterway, at Klickitat Avenue, Seattle, Wash.—

Plans and map of location for a trestle bridge were approved August 17, 1911.

Bridge of the Pennsylvania Co. (operating the Pittsburg, Fort Wayne & Chicago Railway Co.) across the South Branch of Chicago River at Stewart Avenue, Chicago.—Modified plans for the construction of a bridge at this point were approved December 15, 1908. New plans were approved August 21, 1911, and the instrument dated December 15, 1908, revoked.

Bridge of the Connecticut Co. across Farm Creek, at Norwalk, Conn.—Plans for the reconstruction of an existing trestle bridge at this point were approved August 22, 1911.

Bridge of The Police Jury of the Parish of Terrebonne, La., across Bayou Terrebonne, at Presqu'ile Plantation, near Houma, La.—Plans and map of location were approved August 25, 1911.

Bridge of the County Commissioners of Limestone and Lauderdale Counties, Ala., across the Elk River at Bedinfield Ferry, near Oliver, Ala.—Plans and map of location were approved September 1, 1911.

Bridge of the New York, New Haven & Hartford Railroad Co. over Barrington River, at Barrington, R. I.—Plans for the reconstruction of an existing bridge at this point (including the erection of a temporary trestle bridge for use during said work of reconstruction) were approved September 7, 1911.

Bridge of the Maryland, Delaware & Virginia Co., across Kent Narrows, Md.—Plans for the reconstruction of an existing bridge at this place were approved September 12, 1911.

Bridge of the Louisiana and Arkansas Railway Co., across Little River, in Catahoula Parish, La.—Plans and map of location were approved September 13, 1911.

Bridge of The Chesaco Park Bridge Co., across Back River, Md.—Plans and map of location were approved September 20, 1911.

Bridge of the city of Chicago, Ill., over North Branch of Chicago River, near Indiana Street.—Plans for a temporary foot pontoon bridge for use during construction of a permanent bridge at Indiana Street were approved September 25, 1911.

Bridge of the Mobile Terminal & Railway Co. over Three-Mile Creek, at Laurent Plantation, Mobile County, Ala.—Plans and map of location were approved October 3, 1911.

Bridge of the County Court of Cabell County, W. Va., across Guyandotte River, about 300 feet above the mouth of Russell Creek, W. Va.—Plans and map of location were approved October 3, 1911.

Bridge of the Louisiana & Arkansas Railway Co. across Black River, near Jonesville, in Catahoula Parish, La.—Plans and map of location were approved October 3, 1911.

Bridge of the Pee Dee Bridge Co. over Great Peedee River, at Savage and Allison's Landing, S. C.—Plans and map of location were approved October 5, 1911.

Bridge of the County Court of Polk County, Tenn., across Hiwassee River, just above the mouth of the Ocoee River, in Polk County, Tenn.—Plans and map of location were approved June 13, 1911, and modified plans were approved October 5, 1911.

Bridge of the Levy Court of Newcastle County, Del., across the Christiana River, at Third Street, in the city of Wilmington, Del.

(*to replace an existing bridge at said place*).—Plans and map of location were approved October 11, 1911.

Bridge of Mr. J. Theriot, of Lafourche Crossing, La., across Bayou Lafourche, at Raceland, La.—Plans and map of location were approved October 18, 1911.

Bridge of the board of supervisors of Leflore County, Miss., across the Tallahatchie River near Minter City, Miss.—Plans and map of location were approved October 26, 1911.

Bridge of the city of Tampa, Fla., across Hillsboro River at Tampa, Fla.—Plans for the reconstruction of an existing bridge at this point were approved October 26, 1911.

Bridge of the Chicago, St. Paul, Minneapolis & Omaha Railway Co. over Chippewa River at Eau Claire, Wis.—Plans and map of location were approved October 30, 1911.

Bridge of the Atlantic Coast Line Railroad Co. across the Chattahoochee River at Alaga, Ala.—Plans for reconstruction of a bridge at this point were approved May 24, 1911. Modified plans were approved October 31, 1911, and the instrument dated May 24, 1911, was canceled.

Bridge of the Baltimore & Ohio Railroad Co. across Allegheny River at Foxburg, Pa.—Plans for false work in connection with repairs to existing bridge at that place were approved November 1, 1911.

Bridge of the board of county commissioners of Duval County, Fla., over Goodbys Lake (Creek) in said county at a point about 8 miles above the city of Jacksonville, Fla.—Plans and map of location were approved November 3, 1911.

Bridges of the Pennsylvania Railroad Co., lessee of the Camden & Burlington Railroad Co., across Assicunk Creek, N. J. (one on the Burlington branch of its railroad at Burlington and the other on the main line of its railroad at Burlington).—Plans and maps of locations were approved November 4, 1911.

Bridge of the city of Houston, Tex., connecting Main Street and Montgomery Avenue, Houston, and extending over Buffalo Bayou and White Oak Bayou, Tex.—Plans and map of location were approved November 6, 1911.

Bridge of the Baker-Wakefield Cypress Co. (Ltd.), of Plattenville, La., across Bayou Lafourche at Plattenville, La.—Plans and map of location were approved November 9, 1911.

Bridge of the board of chosen freeholders of Atlantic County, N. J., across Patcong Creek at Steelmanville, N. J.—Plans for the reconstruction of an existing bridge at this point were approved November 10, 1911.

Bridge of the Georgetown & Western Railroad Co. over Lynchs River near Johnsonville, S. C.—Plans and map of location were approved November 13, 1911.

Bridge of the Philadelphia & Long Branch Railroad Co. across Barnegat Bay at Seaside Park, N. J.—Plans for the reconstruction of an existing bridge at this place were approved November 13, 1911.

Bridge of the State highway commissioner of the State of Washington and the board of county commissioners of Skagit County, Wash., across the Skagit River near Mount Vernon, Wash.—Plans and map of location were approved November 17, 1911.

Bridge of the Bellingham & Skagit Railway Co. across Skagit River near Mount Vernon, Wash.—Plans and map of location were approved November 17, 1911.

Bridge of the town of Gassaway, W. Va., over Elk River at Gassaway, Braxton County, W. Va.—Plans and map of location were approved November 21, 1911.

Bridge of the Lake Shore & Michigan Southern Railway Co. across the Portage River near Port Clinton, Ohio.—Plans for a temporary bridge for use during construction of a permanent bridge authorized by the Secretary of War February 21, 1910, were approved November 28, 1911.

Bridge of the Wisconsin Highway Commission, Wisconsin, across the Fox River between the towns of Moundville and Buffalo, Marquette County, Wis.—Plans for the reconstruction of an existing bridge at this place were approved November 28, 1911.

Bridge of the city of Boston, Mass., across the main or north channel of the Mystic River, at Boston, Mass.—Plans and map of location for the reconstruction of an existing bridge at this point were approved December 5, 1911, in lieu of alteration required by War Department notice dated June 3, 1910, and the instrument of approval for temporary bridge dated September 3, 1910, revoked.

Bridge of the Iberia, St. Mary & Eastern Railroad Co., over Bayou Teche near Charenton, La.—Plans and map of location were approved December 8, 1911.

Bridge of Gloucester County, N. J., over Mantua Creek at Mount Royal, N. J.—Plans and map of location (for a new bridge to take the place of an existing structure) were approved December 8, 1911.

Bridge of the Dauphin Island Railway & Harbor Co., over the Fowl River, at Mobile, Ala.—Plans and map of location were approved December 12, 1911.

Bridge of the Dauphin Island Railway & Harbor Co., over Dog River at Mobile, Ala.—Plans and map of location were approved December 12, 1911.

Bridge of the Mobile West Shore Traction Co., of Mobile, Ala., across Fowl River at Mobile, Ala.—Plans and map of location were approved December 13, 1911.

Bridge of the Mobile West Shore Traction Co. of Mobile, Ala., across the Dog River, Ala.—Plans and map of location were approved December 13, 1911.

Bridge of the Board of Chosen Freeholders of the county of Bergen, N. J., across the Hackensack River between Hackensack and Ridgefield Park, N. J.—Plans and map of location were approved December 12, 1908, and modified plans were approved December 18, 1911.

Bridges of the Board of County Commissioners of Orange County, Fla., across the St. Johns River, at Geneva Ferry, Orange County, Fla. (one above Lake Jessup and one below).—Plans and maps of location were approved December 21, 1911.

Bridge of Mineral Range Railroad Co., across Portage Lake at Houghton, Mich.—Plans for reenforcement of an existing bridge at this point were approved December 27, 1911.

Bridge of the County of Walker, Ala., across Mulberry Fork of the Black Warrior River at the foot of Sanders Shoals, Ala.—Plans were approved by War Department, December 30, 1911.

Bridge of the Atlantic Coast Line Railway Co. over Hillsboro River at Tampa, Fla.--False work, plans approved by War Department, January 6, 1912.

Bridge of the State of Washington, across the North Fork of the Lewis River at Woodland, Wash.—Plans and map of location were approved January 8, 1912.

Bridge of the New York & Long Branch Railroad Co., across the South Branch of the Shrewsbury River between Little Silver and Branchport, N. J.—Plans for reconstruction of an existing bridge at this point were approved January 9, 1912.

Bridge of the Buffalo Creek Railroad, across Buffalo Creek, in the city of Buffalo, N. Y.—Plans and map of location were approved January 10, 1912.

Bridge of the Counties of Lafayette and Suwanee, Fla., across the Suwanee River, at Dowling Park, Fla.—Plans and map of location were approved January 11, 1912.

Bridge of Cuyahoga County, Ohio, across the Cuyahoga River, at Detroit-Superior Avenues, in the city of Cleveland, Ohio.—Plans and map of location were approved January 11, 1912.

Bridge of Essex County, Mass., across Saugus River, between the city of Lynn and the town of Saugus, Mass.—Plans for reconstruction of an existing bridge at this place, including a temporary bridge without a draw alongside of existing bridge, were approved January 11, 1912.

Bridge of the West Bay Co. across a narrow channel which separate the outer or ocean beach from the mainland of Long Island at Westhampton Beach, Suffolk County, N. Y.—Plans for the reconstruction of an existing bridge at this point were approved January 12, 1912.

Bridge of the Bay City Terminal Railroad Co. (of the Grand Trunk Railway System) across Saginaw River at Bay City, Mich.—Plans and map of location were approved July 19, 1911, and modified plans were aproved January 13, 1912, and the instrument dated July 19, 1911, was revoked.

Bridge of the Atlantic Coast Line Railroad Co. across Baines Creek, near Port Norfolk, Va.—Plans and map of location for reconstruction of an existing bridge at this point were approved January 13, 1912.

Bridge of the board of bridge commissioners appointed by an act of the General Court of Massachusetts, approved July 20, 1911, across Weymouth Back River, between the towns of Weymouth and Hingham, Mass.—Plans for the reconstruction of an existing bridge at this place were approved January 17, 1912.

Bridge of the Board of County Commissioners of Choctaw County, Okla., across the Kiamichi River about one-fourth mile southwest of Roby (or Sawyer), Okla.—Plans and map of location were approved January 20, 1912.

Bridge of the County Commissioners of Bristol County, Mass., across Taunton Great River, between the city of Fall River and the town of Somerset, Mass.—Plans for the reconstruction of an existing bridge at this place were approved January 22, 1912.

Bridge of the Board of County Commissioners of Choctaw County, Okla., across the Kiamichi River, about 4 miles south of Port Tow-

son, Choctaw County, Okla.—Plans and map of location were approved January 25, 1912.

Bridges of the Wheeling & Lake Erie Railroad Co. across the Cuyahoga River, in the city of Cleveland, Ohio.—Plans for reconstruction of two existing bridges at this point were approved January 29, 1912.

Bridge of the Board of County Commissioners of Duval County, Fla., across McGirts Creek, at Ortega, Fla.—Plans and map of location were approved January 29, 1912.

Bridge of the Commissioners of Outagamie County and the village of Kimberly, Wis., across the Fox River at the village of Kimberly, Wis.—Plans and map of location were approved January 29, 1912.

Bridge of the Board of County Commissioners of Walton County, Fla., across Black Creek, about 6 miles east of Freeport, Fla.—Plans and map of location were approved February 14, 1912.

Bridge of the Oregon Electric Railway Co. across the Willamette River about 1 mile above Harrisburg, Oreg., and to construct pile dikes at the easterly end of said bridge.—Plans and map of location were approved February 14, 1912.

Bridge of the Bellingham and Skagit Railway Co. across the Skagit River, near Mount Vernon, Skagit County, Wash.—Plans and map of location were approved November 17, 1911, and under date of February 16, 1912, the instrument was revoked. New plans for the bridge were approved February 16, 1912.

Bridge of the Board of Supervisors of Princess Anne County, Va., across Long Creek, near Lynnhaven Inlet, Va.—Plans and map of location were approved February 26, 1912.

Bridge of Pike County, Ky. (through its county judge), across Russell Fork of the Big Sandy River, at Elkhorn City, Ky.—Plans and map of location approved February 27, 1912.

Bridge of the town of Norwalk, Conn., across Norwalk River, at Washington Street, Norwalk, Conn.—Plans and map of location were approved March 1, 1912.

Bridge of the Board of County Commissioners of Wyandotte County, Kans., across the Kansas River at West Kansas Avenue, Kansas City, Kans.—Plans for the reconstruction of an existing bridge at this point were approved March 4, 1912.

Bridges of the Board of Chosen Freeholders of the County of Cape May, N. J., across Leonards Thorofare, Ingrams Thorofare, and Gravens Thorofare, on the line of the road from Swainton to Avalon, N. J.—Plans and map of location were approved March 4, 1912.

Bridge of the Board of Chosen Freeholders of Cape May County, N. J., across Main Thorofare, Little Bay, N. J.—Plans and map of location were approved March 5, 1912.

Bridge of the Commissioners of Lake County, Ind., across Indiana Harbor Canal at Chicago Avenue, East Chicago, Ind.—Plans and map of location were approved March 6, 1912.

Bridge of the Commissioners of Lake County, Ind., across Indiana Harbor Canal at Canal Street, East Chicago, Ind.—Plans and map of location were approved March 7, 1912.

Bridge of the Board of County Commissioners of Snohomish County, Wash., across Davis Slough, Puget Sound, near Stanwood, Wash.—Plans for reconstruction of a bridge at this point were approved March 9, 1912.

Bridge of the Board of County Commissioners of Gordon County, Ga., across the Oostanaula River at Millers Ferry, Ga.—Plans and map of location were approved March 12, 1912.

Bridge of the city of Sturgeon Bay, Wis., across a channel of Sturgeon Bay, Wis.—Plans for the reconstruction of the pile trestle approach to an existing bridge at this locality were approved March 14, 1912.

Bridges of the Long Beach Turnpike Co., across North Point Thorofare, Salmons Island Thorofare, West Thorofare, and East Thorofare, N. J.—Plans and map of location were approved March 14, 1912.

Bridge of the Walkerton & Mattaponi Bridge Co., of Walkerton, Va., across the Mattaponi River at Walkerton, Va.—Plans for the reconstruction of an existing bridge at this point were approved March 14, 1912.

Bridge of the County Commissioners of Snohomish County, Wash., across Ebey Slough, in section 3, township 28 north, range 5 east, Willamette meridian, Wash.—Plans and map of location were approved March 15, 1912.

Bridge of the Commissioners of Outagamie County and the village of Kimberly, Wis., across the Fox River at the village of Kimberly, Wis.—Plans and map of location were approved January 29, 1912. New plans were approved March 20, 1912, and the instrument dated January 29, 1912, was canceled.

Bridge of the Lake Shore & Michigan Southern Railway Co., across Buffalo Creek, near Buffalo, N. Y.—Plans for the reconstruction of an existing bridge at this point were approved July 8, 1911. New plans were approved March 16, 1912, and the instrument dated July 8, 1911, was canceled.

Bridge of the Philadelphia, Baltimore & Washington Railroad Co. (through the Pennsylvania Railroad Co.) across Bush River, Md.—Plans for the reconstruction of an existing bridge at this point were approved March 19, 1912.

Bridge of the Philadelphia, Baltimore & Washington Railroad Co. (through the Pennsylvania Railroad Co.) across Gunpowder River, Md.—Plans for the reconstruction of an existing bridge at this locality were approved March 19, 1912.

Bridge of the Northern Electric Railway Co. across the Sacramento River, at Meridian, between the counties of Sutter and Colusa Cal.—Plans and map of location were approved March 19, 1912.

Bridges of the Central Railroad of New Jersey across the Passaic and Hackensack Rivers, N. J.—Plans and map of location were approved June 19, 1911, and under date of March 22, 1912, the instruments were canceled. New plans for the bridges were approved March 22, 1912.

Bridge of the Grand Trunk Railway System across the entrance to Back Cove, Portland Harbor, Me.—Plans for the reconstruction of an existing bridge at this point were approved March 27, 1912.

Bridge of the Avoca Drainage District Commission across Bayou Boeuf, at Avoca Plantation, La.—Plans and map of location were approved April 1, 1912.

Bridge of the County Court of Calhoun County, W. Va., across the Little Kanawha River, at Grantsville, W. Va.—Plans and map of location were approved October 27, 1909, and March 10, 1910. Modified plans were approved April 3, 1912.

Bridges of the New York Connecting Railroad Co. across the East River, at Little Hell Gate and the Bronx Kills, near Astoria, N. Y.—Plans were approved April 4, 1912, for modification of these bridges in lieu of plans approved June 22, 1906, for the proposed structures across Little Hell Gate and Bronx Kills.

Bridge of the Iberia, St. Mary & Eastern Railroad Co. across Bayou Teche, near Oaklawn Plantation, St. Mary Parish, La.—Plans and map of location were approved April 6, 1912.

Bridge of the Pennsylvania Railroad Co. across the Schuylkill River in the city of Philadelphia, Pa.—Plans for the reconstruction of the fenders of an existing bridge at this place were approved April 10, 1912.

Bridge of the Long Island Railway Co. across Long Beach Channel, at Wreck Lead, Long Island, N. Y.—Plans for the reconstruction of an existing bridge at this locality were approved April 26, 1912.

Bridge of the Northern Electric Railway Co. over Sacramento River, at Chico Landing, Cal.—Permission for the construction of a temporary bridge at this place was granted May 3, 1912.

Bridge of Michael Sholtz across Halifax River, Fla., to connect Daytona with Daytona Beach and Seabreeze, Fla.—Plans and map of location were approved May 4, 1912.

Bridge of the Boards of Commissioners of New Hanover and Pender Counties, N. C., across the North East River, near Castle Hayne, N. C.—Plans and map of location were approved May 17, 1912.

Bridge of John S. Collins across Biscayne Bay, at Miami, Fla.—Plans and map of location were approved May 17, 1912.

Bridge of the Wabash Railroad Co. across the Illinois River, near Valley City, Ill.—Plans for the reconstruction of an existing bridge at this point were approved May 17, 1912.

Bridge of the city of New London, Wis., across Wolf River, between Shawano and Door Streets, New London, Wis.—Plans and map of location were approved May 23, 1912.

Bridge of the town of Harpswell, Me., across tidewater between Orrs Island and Great Island, Me.—Plans for the reconstruction of an existing bridge at this locality were approved May 23, 1912.

Bridge of the Board of Chosen Freeholders of the County of Union, N. J., across the Rahway River, at Lawrence Street, Rahway, N. J.—Plans and map of location were approved May 23, 1912.

Bridge of the Board of Chosen Freeholders of Bergen, Essex, and Hudson Counties, N. J., across the Passaic River (locally known as the Belleville Bridge) between the cities of Newark and Passaic, N. J.—Plans for the reconstruction of an existing bridge at this point were approved May 25, 1912.

Bridge of the Board of Chosen Freeholders of Atlantic County, N. J., across Inside Thorofare at Albany Avenue, Atlantic City, N. J.—Plans for the reconstruction of an existing bridge at this point were approved June 5, 1912.

Bridge of the Oregon-Washington Railroad & Navigation Co., across the Chehalis River, near Montesano, Wash.—Plans and map of location were approved June 7, 1912.

Bridge of the city of Port Huron, Mich., across Black River, connecting Huron Avenue and Military Street, Port Huron, Mich.—Plans and map of location were approved June 8, 1912.

Bridge of the city of Pittsburgh, Pa., across the Monongahela River at South Tenth Street, Pittsburgh, Pa.—Plans for repairs to the south river pier of this bridge were approved June 10, 1912.

Bridge of the Wheeling & Lake Erie Railroad Co., across Cuyahoga River, in the city of Cleveland, Ohio.—Plans for the reconstruction of two existing bridges at this point were approved January 29, 1912. Modified plans were approved June 10, 1912, and the instruments dated January 29, 1912, were canceled.

Bridge of the Wildwood & Delaware Bay Short Line Railroad Co., N. J., across Old Turtle Creek and Grassy Sound Channel in the Township of Middle Cape May County, N. J.—Plans and map of location were approved June 11, 1912.

Bridges of Duval County, Fla., across Trout Creek on the Lem Turner Road, Duval County, Fla.—Plans and map of locations were approved June 11, 1912.

Bridge of the Atlantic Coast Line Railroad Co. across the Edisto River, near Jacksonboro, S. C.—Plans for the reconstruction of an existing bridge at this point were approved June 11, 1912.

Bridge of the Grosse Isle Railway Co. (successor to P. N. Jacobson) across the west channel of the Detroit River to Grosse Isle, near the city of Wyandotte, Mich.—Plans for the construction of a bridge at this point were approved June 11, 1912, and the instrument of approval issued to P. N. Jacobson, dated March 12, 1910, was canceled.

Bridge of the Elizabeth Park & Land Co. across Broad Creek, about 2 miles east of Norfolk, Va.—Plans and map of location were approved February 14, 1902. New plans were approved June 17, 1912, and the instrument dated February 14, 1902, was revoked.

Bridge of the Long Beach Turnpike Co. across Manahawken Bay, along the proposed turnpike of the Long Beach Turnpike Co., between Hilliards and Barnegat City Junction, N. J.—Plans and map of location were approved June 17, 1912.

Bridge of the Oakland, Antioch & Eastern Railway across Montezuma Slough, a tributary of Suisun Bay, Cal.—Plans and map of location were approved June 17, 1912.

Bridge of the Long Beach Turnpike Co. across East Thorofare, N. J.—Plans and map of location were approved March 14, 1912. New plans were approved June 18, 1912, and the instrument dated March 14, 1912, was canceled.

Bridge of the County Court of Wyoming County, W. Va., across the Guyandotte River at Baileysville, W. Va.—Plans and map of location were approved June 19, 1912.

Bridge of the County Court of Calhoun County, W. Va., across the Little Kanawha River, at Grantsville, W. Va.—Plans and map of location were approved April 3, 1912. New plans were approved June 21, 1912, and the instrument dated April 3, 1912, was canceled.

Bridge of the Board of Supervisors of Harrison County, Miss., across Biloxi River, at Lorraine, Miss.—Plans and map of location were approved June 28, 1912.

BRIDGES OBSTRUCTING NAVIGATION.

Under the requirements of section 18 of the river and harbor act approved March 3, 1899, the Secretary of War notified the persons, corporations, or associations owning or controlling certain bridges obstructing navigation, after giving them a reasonable opportunity to be heard, to so alter said bridges as to render navigation through or under them reasonably free, easy, and unobstructed, specifying in the notice the alterations required to be made and prescribing a reasonable time within which to make them, as follows:

Bridge of the Southern Pacific Co. over Napa River, near Napa Junction, Cal.—Notice dated October 9, 1911, was served on the Southern Pacific Co., October 23, 1911. Specified alterations to be made and completed within 60 days from date of service of notice.

Bridge of the St. Charles Air Line, across the South Branch of the Chicago River, near Sixteenth Street, Chicago, Ill.—Notices dated March 14, 1912, were served March 21, 1912, on the Chicago, Burlington & Quincy Railroad Co.; the Illinois Central Railroad Co.; the Chicago & North Western Railway Co., and on April 3, 1912, on the Michigan Central Railroad Co., owners of the bridge. Specified alterations to be completed on or before May 1, 1914.

STRUCTURES OTHER THAN BRIDGES IN THE NAVIGABLE WATERS OF THE UNITED STATES.

Pursuant to the provisions of sections 9 and 10 of the river and harbor act of March 3, 1899, and of certain special acts of Congress, numerous applications for permission to build structures of various kinds other than bridges (such as dams, wharves, dolphins, booms, weirs, etc.) in the navigable waters of the United States have been examined with a view to the protection of navigation interests.

Upon the recommendation of the Chief of Engineers, permits have been granted by the Secretary of War for the erection of a number of such structures, but specific reference is not deemed necessary except in the following cases:

1. Dam of the Great Northern Development Co. across the Mississippi River at Coon Rapids, Minn.—The construction of this dam was authorized by act of Congress approved January 12, 1911, and plans and map of location were approved September 20, 1911, and amended December 14, 1911, by eliminating condition No. 3.

2. Dam of the Ozark Power & Water Co. across White River, near Forsyth, Taney County, Mo.—The construction of a dam at this locality was authorized by act of Congress approved February 4, 1911, and plans and map of location were approved November 24, 1911.

3. Dam of Herman L. Hartenstein across St. Joseph River, near Mottville, Mich.—The construction of this dam was authorized by act of Congress approved February 13, 1911, and plans and map of location were approved February 13, 1912.

4. Dam of the Cuyuna Range Power Co. across Crow Wing River, in Crow Wing County, Minn.—The construction of a dam at this place was authorized by State law, and plans and map of location were approved April 12, 1912.

5. Dam of the Wisconsin River Power Co. across the Wisconsin River, near Prairie du Sac, Wis.—Modified plans for a dam at this place were approved May 11, 1912.

6. *Dam of the Board of Commissioners of Jefferson and Plaquemine Drainage District, La., across Bayou Barataria, La., near the entrance to the Harvey Canal.*—Plans and map of location were approved June 7, 1912.

7. *Dam of the Pike Rapids Power Co. across Mississippi River in Morrison County, near Royalton, Minn.*—The construction of a dam at this locality was authorized by act of Congress approved June 4, 1906, as amended by acts of March 7, 1907, and March 4, 1911. Plans and map of location were approved July 1, 1912.

REPAIRS TO AQUEDUCT BRIDGE, DISTRICT OF COLUMBIA.

Operations under this head were in charge of Lieut. Col. W. C. Langfitt, Corps of Engineers.

Examination and repair of piers.—The piers of this bridge, originally constructed to carry a canal across the Potomac at Washington, D. C., were built between 1835 and 1840, of Potomac River gneiss, laid in the form of rough rubble masonry, except the ice breakers, which are of cut granite. In 1868 a floor system and approaches were added and the structure was used as a highway toll bridge until 1886, when the Government purchased it and erected the present superstructure on the old piers. Shortly after the freshet of June, 1889, pier No. 1 (the first from the Virginia end) was observed to have moved several inches, and defects in other piers were noticed. An examination and the first repairs of which there is any record were made at that time under the direction of the Commissioners of the District of Columbia, to whose custody the bridge had been transferred.

Examinations by diver and such minor repairs as were found necessary have been made from time to time since under the direction of the Secretary of War. These examinations have shown that there is in process a gradual deterioration of the masonry of the piers below the water line. The defects show usually in the form of cavities caused by the dropping out, during freshets, of one or more of the stones in or near the face. These cavities have usually been repaired by filling them with concrete in bags, deposited by a diver. In some instances the repaired portions have been protected by placing riprap in front of them. In three of the piers, Nos. 1, 4, and 5, the defects became so serious that this method of repair was impracticable, and new piers have been built to replace the old ones.

The first repairs made under the direction of the War Department were provided for by act of Congress of August 7, 1894, which appropriated $51,070 for this purpose. Piers 2, 3, 5, 6, 7, and 8 were repaired by the use of concrete in bags, placed by a diver, and repairs to pier 4 by the use of a cofferdam were commenced. The total expenditure was $46,379.70. The balance of $4,690.30, being insufficient to complete the work at pier 4, reverted to the Treasury. Piers 4, 5, and 1 were subsequently entirely rebuilt under separate appropriations of $65,000, $65,000, and $80,000, respectively.

Congress by joint resolution approved July 1, 1902, enacted as follows:

> That the Secretary of War be, and he is hereby, authorized to spend an amount not exceeding three thousand dollars from the balance of appropriations for the reconstruction of pier numbered four of the Aqueduct Bridge, District of Columbia, for the purpose of the examination of and immediate temporary repairs to the remaining piers of said bridge in cases of need arising from flood or ice.

The act of Congress approved March 2, 1907, making appropriations for the expenses of the government of the District of Columbia for the fiscal year ending June 30, 1908, contains the following item:

> And the unexpended balance, amounting to about fourteen thousand dollars, of the appropriations for the reconstruction of piers numbered four and five of said bridge is hereby reappropriated and made available for the periodical examination of the remaining piers of the bridge and making of such repairs as may be found necessary.

The last examination of the old piers by diver was made during October, 1911, and such defects as were found were repaired in the usual manner, by the use of concrete in bags, and the piers left in as good condition as practicable.

While this method of repair may prolong the life of the piers to a certain extent, it is believed to be only a question of time when all of the old piers will have reached a stage when this method will be impracticable, even for temporary repairs.

Tentative plans and estimates have been prepared for a more radical scheme of repair, and soundings and probings have been made to determine the amount of work required.

Estimates for three plans for remedying existing conditions submitted in annual report for fiscal year 1910 are here repeated:

A. For complete removal of the present bridge and replacing it with a new one, including new superstructure, $950,000.

B. For complete removal of the remaining five old piers and replacing them with new ones and repairing the abutments, using the present superstructures, $350,000.

C. For thoroughly and permanently repairing the remaining five old piers and two abutments, using the present superstructure, $150,000.

It is again recommended that this matter be brought to the attention of Congress with a view to the adoption of one of the projects mentioned above, any one of which will provide a substantial and stable structure, without the present liability of being rendered unstable in one or more of the old piers by the removal of a number of stones from the piers during an unusually heavy freshet. These different projects were explained in the report of the officer in charge for the fiscal year 1910. A possible objection to project C above is that the repairs under this project might detract from the appearance of the bridge. It is suggested, therefore, that the proper committee of Congress might direct the Commission of Fine Arts, established by act of the second session, Sixty-first Congress, to render an opinion.

July 1, 1911, balance unexpended	$11, 362. 57
June 30, 1912, amount expended during fiscal year	1, 118. 77
July 1, 1912, balance unexpended	10, 243. 80

(See Appendix C C C.)

MAINTENANCE AND REPAIR OF THE WASHINGTON AQUEDUCT, DISTRICT OF COLUMBIA, AND WASHINGTON AQUEDUCT, DISTRICT OF COLUMBIA, FILTRATION PLANT.

Operations under this head were in the charge of Lieut. Col. W. C. Langfitt, Corps of Engineers, having under his immediate orders Capt. Warren T. Hannum, Corps of Engineers, from July 1, 1911, to February 15, 1912, and First Lieut. Jarvis J. Bain, Corps of Engineers, from May 21, 1912, to the end of the fiscal year.

Washington Aqueduct, D. C.: 1. Maintenance and operation of the Washington Aqueduct and its accessories.—Appropriations for maintenance and operation of the Washington Aqueduct are applied to the improvement, maintenance, and repair of those parts of the water-supply system which are under the supervision of the Chief of Engineers. These are the masonry dam across the Potomac at Great Falls; the works there for regulating the supply to the conduit; the Conduit Road from Great Falls to Washington, a distance of about 14 miles; the conduit from Great Falls to the Georgetown reservoir, a distance of about 12 miles; the three reservoirs for supplying the city; the tunnel, about 4 miles long, connecting the Georgetown and McMillan Park reservoirs; the two bridges for carrying the mains across Rock Creek; and other auxiliary works. A description of these works may be found in the Annual Report of the Chief of Engineers, 1903, pages 2485–2487.

The original project for construction of the Washington Aqueduct was dated February 12, 1853, and published as Senate Executive Document No. 48, Thirty-second Congress, second session. The project provided for supplying the city of Washington with water taken from the Potomac River at Great Falls, Md., about 14 miles above the city and 16½ miles from the present filtration plant, and with water from Little Falls Branch. Work was begun in 1853, and in 1859 water from Little Falls Branch was supplied to the city through the conduit. The first Potomac water was supplied to the city in December, 1863.

The water from Little Falls Branch became polluted, and works for excluding it were completed in 1895. The dam at Great Falls was raised during 1896 and the capacity of the system increased to its present extreme limit of 90,000,000 gallons per day, or, making allowances for sudden increases in consumption, to a safe limit of 65,000,000 gallons. For a discussion of the capacity of the system see Annual Reports of the Chief of Engineers for 1897, pages 3991–4014; for 1906, pages 2093–2095; and for 1909, pages 2310–2311.

During the year the gatehouses and other structures were kept in good repair, and about 47,275 square yards of road have been resurfaced and treated with tarvia. As explained in the report of the officer in charge of the Washington Aqueduct for the fiscal year ending June 30, 1911 (Appendix D D D), the usual appropriation of $33,000 is not sufficient to provide for the proper maintenance of the aqueduct and its accessories, and the amount is increased, in estimates submitted, to $38,000, thus providing $5,000 for maintaining the Conduit Road in good condition when once placed in such condition. The character and amount of traffic, especially of automobiles, has caused its rapid deterioration in the last few years. In this connection attention is invited to item 4 of the report of the officer in charge.

Bridge No. 6 across Rock Creek is no longer an integral part of the aqueduct system but is maintained solely for the benefit of the city. As this bridge is entirely too narrow for the traffic passing over it and needs to be widened, it is recommended that its formal transfer to the city be authorized.

Prior to August, 1905, the mains leading to the city from the Georgetown (distributing) reservoir were used for a gravity supply to a part of the city of Washington, and they were maintained by the United States. On August 21, 1905, as the filtration plant had been so far completed that a portion of it could be put into operation, the gates connecting the Georgetown reservoir with the mains referred to were closed, and the entire flow of water for the section which they supplied was sent through the tunnel to the filtration plant and thence to those mains for distribution. They accordingly became an essential part of the city distribution system, and, by mutual agreement, they have since been operated and maintained by the city water department. It is recommended that their formal transfer to the city be authorized.

WASHINGTON AQUEDUCT, DISTRICT OF COLUMBIA, 1911, MAINTENANCE.

July 1, 1911, balance unexpended	$2,546.03
June 30, 1912, amount expended during fiscal year	2,546.03

WASHINGTON AQUEDUCT, DISTRICT OF COLUMBIA, 1912, MAINTENANCE.

Amount appropriated Mar. 2, 1911	$33,000.00
June 30, 1912, amount expended during fiscal year	31,186.76
July 1, 1912, balance unexpended	1,813.24
July 1, 1912, outstanding liabilities	1,813.24

2. *Lining tunnels.*—The total length of unlined tunnel of the aqueduct through rock is 4,364 feet, and there are places where the rock is disintegrating and falling from the sides and roofs. Those places should be lined both for the sake of the stability of the aqueduct and to remove the danger to the lives of the employees engaged in cleaning and inspection. The best engineering practice of the present day requires the lining of all tunnel in rock for aqueduct use. By act of Congress approved March 2, 1911, the sum of $8,000 was appropriated for the purpose of commencing the work, and an estimate of $12,000 is submitted for its continuance during the fiscal year 1914. The actual work of lining can only be done when conditions permit the draining of the aqueduct.

During the fiscal year a concrete wasteweir was built and a sluice gate installed. About 140 cubic yards of rock was blasted from the bottom of the tunnel, and 161 linear feet of 15-inch draintile was laid surrounded by concrete; 186 linear feet of the invert of the concrete lining and 45 linear feet of arch was built. Besides the work done in the tunnel, a landing was built to receive materials at the side of the Chesapeake & Ohio Canal, a derrick was erected, a concrete mixer was purchased and installed, a collapsible steel form for use in building the lining was purchased, and considerable sand and gravel are now on hand to continue the work in 1913.

WASHINGTON AQUEDUCT, DISTRICT OF COLUMBIA, 1912—LINING TUNNELS.

Amount appropriated by act approved Mar. 2, 1911	$8,000
June 30, 1912, amount expended during fiscal year	8,000

3. *Preservation and repair of Cabin John Bridge.*—By act of Congress approved March 2, 1911, provision was made "for the preservation and repair of Cabin John Bridge, including the installation of a metal lining to prevent leakage in the portion of the aqueduct passing through the bridge, of which $20,000 shall be immediately available, $35,000."

All of the cast-iron lining has been installed and grouted, and the plates have been lined with concrete. Steel tie rods were placed through each end of the bridge, the roadway was resurfaced with asphalt blocks and the coping along the sides of the bridge reset.

WASHINGTON AQUEDUCT, DISTRICT OF COLUMBIA, 1911–12—PRESERVATION AND REPAIR OF CABIN JOHN BRIDGE.

July 1, 1911, amount unexpended	$34, 086.72
June 30, 1912, amount expended during fiscal year	30, 716.16
July 1, 1912, balance unexpended	3, 370.56
July 1, 1912, outstanding liabilities	1, 850.00
July 1, 1912, balance available	1, 520.56

4. Conduit Road, reconstruction.—The Conduit Road is approximately 12½ miles long from Foxhall Road to Great Falls, and is a necessary feature of the current work of operation and maintenance of the conduit, especially while awaiting the construction of public roads on either side. Its advantages were early appreciated, the officer in charge reporting in 1868 that it should be macadamized as soon as practicable. Between 1870–1875, $46,000 were appropriated for this purpose, and 9.4 miles surfaced. Since the latter date but $4,000 have been especially appropriated for the road, the last of which was $2,000 in 1900. The small amounts which could be spared from the regular appropriation have been wholly and totally inadequate for maintenance alone. When any considerable amount of repairs of the road has been attempted it has been at the expense of other parts of the system requiring repair.

For details and a more complete description of the present conditions and needs, attention is invited to item 4 of the report of the officer in charge.

By act of Congress approved June 26, 1912, an appropriation of $15,000 was made for beginning the surfacing and improvement of the Conduit Road from Foxhall Road to Great Falls during the fiscal year 1913. It is estimated that about $30,000 additional will be needed to complete this work. An estimate of $15,000 is submitted for continuing the work in the fiscal year 1914, and an appropriation of this amount is strongly urged.

5. Increasing the water supply at Washington, D. C.—By act of Congress approved May 26, 1908, $10,000 was appropriated for preliminary investigations and surveys for increasing the water supply.

The results of these investigations, with recommendations, were made the subject of a special report to the Chief of Engineers by the officer in charge, which report was submitted on July 8, 1909.

On pages 4, 5, 7, 8, 84, and 85 of said report reference is made to increasing the water supply by using the Patuxent River as a source.

By act of Congress approved March 2, 1911, the sum of $3,000 was appropriated for investigating the availability and adaptability of that river as a water supply for the District of Columbia. As the appropriation was a fiscal year appropriation no investigation could be begun until after July 1, 1911. A special report on the subject will be submitted early in the fiscal year 1913.

INCREASING THE WATER SUPPLY OF WASHINGTON, DISTRICT OF COLUMBIA—PRELIMINARY INVESTIGATIONS AND SURVEYS.

Amount appropriated by act approved Mar. 2, 1911	$3,000.00
June 30, 1912, amount expended during fiscal year	2,857.55
July 1, 1912, balance unexpended	142.45
July 1, 1912, outstanding liabilities	142.45

6. *Metering water supply of United States buildings and grounds.*—The necessity for the prompt installation of meters is explained in the report on "Increasing the water supply of the District of Columbia," House Document No. 347, Sixty-first Congress, second session. The finding in this report that a new aqueduct was not necessary was based on the assumption, among others, that metering of all services in the District of Columbia would be immediately provided for.

While the work done by the engineer department of the District of Columbia to detect and prevent the waste of water is highly commendable and the results accomplished are exceptional, a study of the consumption of water in the District of Columbia in its relation to air temperatures has led the officer in charge to conclude that the necessity for the general and complete installation of meters is still very urgent, not only to remove the necessity of an expenditure of $5,000,000 or $6,000,000 for the construction of a new aqueduct, but also to remove the possibility of the consumption of water exceeding the maximum capacity of the aqueduct, which is still likely to happen in case of the recurrence of a period of cold weather similar to that of the winter of 1904–5.

An installation of meters made immediately may postpone for several years the need for the construction of a new aqueduct.

By act of Congress approved May 18, 1910, the sum of $7,000 was appropriated to begin the work of metering the United States buildings, reservations, and grounds during the fiscal year 1911. This provided for "The purchase, installation, and maintenance of water meters to be placed on water services of the Government Printing Office, the United States navy yard, and the Municipal Building of the District of Columbia, said meters to be purchased, installed, maintained, and remain under the observation and control of the officer in charge of the Washington Aqueduct."

The work provided for by the above act was completed.

WASHINGTON AQUEDUCT, D. C., 1911—METERING GOVERNMENT SERVICES.

July 1, 1911, amount unexpended	$4,007.96
June 30, 1912, amount expended during fiscal year	3,871.13
July 1, 1912, balance unexpended	[1] 136.83
July 1, 1912, outstanding liabilities	0.00
July 1, 1912, balance available	0.00

No appropriation for installing meters was made for the fiscal year 1912; but, by act of Congress approved June 26, 1912, an appropriation of $4,850 was made for metering the water services to the Marine Hospital, Soldiers' Home, Howard University, Freedmen's Hospital, Walter Reed Hospital, and Zoological Park in the fiscal year 1913.

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[1] Reverted and dropped.

An estimate of $33,150 is submitted to complete the metering of supplies to Federal institutions. So far but three such services have been metered and six others provided for out of a total of approximately 285 services.

7. Washington Aqueduct, District of Columbia, filtration plant: Maintenance and operation.—By act of Congress approved March 2, 1911, the sum of $91,000 was appropriated for maintenance and operation of the Washington Aqueduct, District of Columbia, filtration plant, for the fiscal year 1912, including preliminary treatment.

The Washington filtration plant consists of a pumping station for raising the water from the McMillan Park reservoir to the filters; of 29 filter beds of the slow-sand type, having an effective filter area of 1 acre each; of a filtered-water reservoir, having a capacity of about 15,000,000 gallons; of the necessary piping and valves for carrying the water, controlling the rates of filtration, etc.; of a sand-washing and storage system, and of a laboratory for testing the water. The filtration plant has been in continuous operation throughout the year, and the entire water supply of the city has been filtered. The bacteria have been reduced from an average of 1,100 per cubic centimeter in the McMillan Park reservoir to an average of 35 in the filtered-water reservoir. The average turbidity has been similarly reduced from 13 to 0 parts per million.

The actual number of bacteria in the city water varied from 460 to 1 per cubic centimeter, while the number in the river water ran from 124,000 to 35. The actual average reduction by months varied between 99.9 and 97.4 per cent.

The work during the year consisted in cleaning and operating the filters; in analyzing samples of water from the several reservoirs, from each filter, and from taps in various parts of the city; in operating and keeping in repair the pumping station, and in doing the necessary clerical work connected with the office. All work was done by hired labor.

The total quantity of water pumped to the filters during the year was 22,668.40 million gallons, or an average of 61.94 million gallons per day. During the year 14,820 cubic yards of sand were washed and 16,095 cubic yards were replaced in the filters.

The cost per million gallons filtered was $4.01. (For details of cost see Appendix D D D.)

A more complete description of the Washington filtration plant may be seen in the Annual Report of the Chief of Engineers for 1906, pages 2101 and 2102.

The turbidity of the river water was exceedingly high throughout the year and exceeded 1,000 26 times, 1,500 18 times, and 2,000 10 times during the year, with the usual accompaniment of high bacterial content. By excluding the water from the system as long as possible by closing the intake gates and by the application of coagulant it was possible to prevent the turbidity of the filtered water exceeding 4, and this for only two days during the year, with an average of 0. The water furnished the city may be considered to have been excellent throughout the year, since the average bacterial content was only 35 per c.c.

MAINTENANCE, WASHINGTON AQUEDUCT (D. C.) FILTRATION PLANT, 1911—GENERAL.

July 1, 1911, balance unexpended	$10,878.59
June 30, 1912, amount expended during fiscal year	10,878.59

MAINTENANCE, WASHINGTON AQUEDUCT (D. C.) FILTRATION PLANT, 1912—GENERAL.

Amount appropriated by act of Mar. 2, 1911	$91,000.00
June 30, 1912, amount expended during fiscal year	78,658.38
July 1, 1912, balance unexpended	12,341.62
July 1, 1912, outstanding liabilities	12,341.62

The estimate submitted for the operation and maintenance of the filtration plant is the same in amount as for the fiscal year 1913.

8. *Remodeling Georgetown Reservoir.*—The necessity for the work was discussed in the Annual Report of the Chief of Engineers for 1908, pages 2365 to 2372. By act of Congress, approved March 2, 1911, the sum of $50,000 was appropriated for remodeling the Georgetown Reservoir in order to continue the works for preliminary treatment of the water supply. By act of Congress, approved June 26, 1912, $58,000 was appropriated for completing this work. The sediment in the raw water will, by preliminary treatment of the water, be precipitated and settle out in the Georgetown Reservoir.

During the present fiscal year contracts were made with William F. Cush for excavation, building dam and concrete stop plank opening, and with R. E. Boiseau for constructing concrete drains, and considerable work was done by hired labor.

WASHINGTON AQUEDUCT, D. C., 1912—REMODELING GEORGETOWN RESERVOIR.

Amount appropriated by act approved Mar. 2, 1911	$50,000.00
June 30, 1912, amount expended during fiscal year	18,289.41
July 1, 1912, balance unexpended	31,710.59
July 1, 1912, outstanding liabilities	4,115.00
July 1, 1912, balance available	27,595.59
July 1, 1912, amount covered by uncompleted contracts	27,595.59

9. *Parking grounds, McMillan Park Reservoir.*—This reservoir, situated near the Soldiers' Home, has a capacity of 300,000,000 gallons. The park has an area of 118 acres. Plans were carefully and intelligently drawn by Olmsted Bros. for attractively parking this whole area. The act of Congress providing for the expenses of the government of the District of Columbia, approved May 26, 1908, authorized the expenditure of not exceeding $6,000 for parking the grounds at the Washington City Reservoir, the funds to be available until the close of the fiscal year 1909. The work performed during that year is described at page 2327 of the Annual Report of the Chief of Engineers for 1909.

The sum of $2,000 appropriated by act of Congress, approved May 18, 1910, for continuing the project, was expended on that part of the park south of the reservoir. Seven hundred cubic yards of soil were purchased, 424 square yards concrete sidewalk were laid, and 249 trees were set out.

The sum of $2,000 appropriated by act of Congress, approved March 2, 1911, for continuing the project, was also expended on the area south of the reservoir. The area was covered with soil and seeded to grass, and 559 square yards of sidewalk, 265 linear feet of tile drains, and 484 linear feet of concrete gutters were laid, and one flight of concrete steps was constructed.

By act of Congress, approved June 26, 1912, $2,000 was appropriated for continuing the parking in the fiscal year 1913.

In order to complete this work it will be necessary to do several thousand yards of grading on the north and west sides of the reservoir, to lay 13,950 square yards of concrete sidewalk, place 9,460 square yards of macadam surface on the roads, purchase 14,125 cubic yards of soil for preparing the ground for planting shrubs and trees, purchase and set out 1,208 trees and 18,400 shrubs, and make other minor changes.

All of the improvements which are now being made are in strict conformity to the plans. An estimate of $8,000 is submitted for continuing the work of parking during the fiscal year 1914.

WASHINGTON AQUEDUCT, D. C., 1911—PARKING GROUNDS, MCMILLAN PARK RESERVOIR.

Amount appropriated by act of Mar. 2, 1911	$2,000
June 30, 1912, amount expended during fiscal year	2,000

10. McMillan Memorial Fountain.—The sundry civil act for the fiscal year 1911 contained the following item:

> For the preparation of the site, approaches, walks, foundation, and piping for the fountain to be erected in McMillan Park, in the District of Columbia, by the James McMillan Memorial Association of Michigan, $15,000.

By arrangement with the Commissioners of the District of Columbia the work provided for was performed under the officer in charge of the Washington Aqueduct, the site for the fountain being under control of the latter officer. The work was completed during the last fiscal year except the construction of the granite work, which was under contract for $8,400, and which was finished in 1912.

No work has been done on the ground toward the erection of the fountain by the James McMillan Memorial Association of Michigan, but it is expected this work will be done during the coming year.

11. Emergency fund.—No expenditures were made from this fund during the year. It is recommended, however, that such a fund be again provided for, to be used only in case of a serious break in one of the important aqueduct or filtration-plant structures, which might endanger or interrupt the water supply, and an estimate is submitted.

ESTIMATES.

The estimates for the fiscal year ending June 30, 1914, are as follows:

For operation, including salaries of all necessary employees, maintenance and repair of the Washington Aqueduct and its accessories, including Conduit Road, the McMillan Park Reservoir, and Washington Aqueduct Tunnel, and also including printing, binding, and blank books, and the purchase and maintenance of one motor truck, horses, vehicles, and harness, and the care and maintenance of the stable	$38,000
For continuing surfacing and improvements of the Conduit Road from Foxhall Road to Great Falls, including printing, binding, and blank books	15,000

For care, including salaries of all necessary employees, maintenance and operation of the Washington Aqueduct, District of Columbia, filtration plant, the plant for the preliminary treatment of the water supply, authorized water meters on Federal services, and for each and every purpose connected therewith, including printing, binding, and blank books	$91,000
For emergency fund, to be used only in case of a serious break requiring immediate repair in one of the important aqueduct or filtration-plant structures, such as a dam, conduit, tunnel, bridge, building, or important piece of machinery, all expenditures from this appropriation to be reported in detail to Congress	5,000
For continuation of parking the grounds of McMillan Park, including printing, binding, and blank books	8,000
For continuing the lining of such portions of the unlined sections of the tunnels of the Washington Aqueduct as may be necessary to prevent the disintegration and fall of rocks, including printing, binding, and blank books	12,000
For completing the purchase, installation, and maintenance of water meters to be placed on the water services to the United States buildings, reservations, or grounds in the District of Columbia, and for each and every purpose connected therewith, said meters to be purchased, installed, and maintained by and remain under the observation of the officer in charge of the Washington Aqueduct, including printing, binding, and blank books	33,150
Total	202,150

(See Appendix D D D.)

IMPROVEMENT AND CARE OF PUBLIC BUILDINGS AND GROUNDS, THE CARE AND MAINTENANCE OF THE WASHINGTON NATIONAL MONUMENT AND OF THE HIGHWAY BRIDGE ACROSS THE POTOMAC RIVER, D. C., AND UPON THE ERECTION OF MONUMENTS, MEMORIALS, ETC., WASHINGTON, D. C., DURING THE FISCAL YEAR ENDING JUNE 30, 1912.

Officer in charge, Col. Spencer Cosby, United States Army, Major, Corps of Engineers.

Miscellaneous repairs were made in and about the Executive Mansion. The entire exterior of the mansion, including the east and west terraces, was repainted, and some painting was done in the interior. The furniture was regularly cared for, and necessary repairs were made to it. In the building for the offices of the President the exterior and all the woodwork in the interior were painted. The President's stable, in the park opposite Seventeenth and E Streets NW., was torn down, and the ground occupied by it improved by grading, soiling, seeding, and rolling. This work was done in accordance with authority contained in the sundry civil act approved March 4, 1911, which provided $1,000 for the purpose. In accordance with the terms of the act, accommodations for the horses, carriages, and other vehicles of the President and of the Executive Office were provided in the stables of the Quartermaster's Department, located at Ninteenth Street and Virginia Avenue NW. The frame building in the rear of the President's stable, used as a stable by the office of Public Buildings and Grounds, was moved to the propogating gardens in the Monument Grounds, to be used as a storehouse. Repairs were made to the greenhouse structures and to their heating apparatus, and four cold frames were constructed. A change was made in the system of lighting the White House grounds.

The care required to maintain them in good condition was extended to the improved parks and small reservations. One additional park space was transferred to the Chief of Engineers by the Commissioners of the District of Columbia. There was also transferred to the Office of Public Buildings and Grounds the reservation in Georgetown containing the old high-service reservoir, which is no longer needed as part of the system for distributing the water supply of the city. The estimates submitted for the service of the fiscal year ending June 30, 1914, include an item for the improvement of this reservation with the view of making it a part of the park system. Ground on Meridian Hill was also brought into the park system under the terms of an act of Congress providing for its condemnation, and the additional ground in the same tract will also be acquired as soon as its purchase is completed. One unimproved reservation was improved, and one partially improved reservation was extensively improved. Considerable work for the improvement of the interior portion of Potomac Park was accomplished. A new bituminous macadam roadway was constructed in Potomac Park Annex near the Tidal Basin outlet, and a similar road was constructed in Potomac Park just across the outlet. One thousand eight hundred Japanese cherry trees, the gift of the city of Tokyo, were planted around the Tidal Basin in that park. Work was started on the construction of a park lodge in Potomac Park. The work of filling the old fish ponds in the Monument Grounds was completed. The improvement of the terraced reservation on Twenty-second Street, near S Street, was completed, and the reservation in Mount Pleasant (310–A) which was acquired from the Commissioners of the District of Columbia in April, 1911, was developed as an intimate neighborhood park. The section of Judiciary Park around the new Court of Appeals Building was redesigned to bring it more in harmony with the architectural features of that building. Various changes and additional landscape improvements were made in two of the circles and in many of the small triangular reservations. One of the old gravel roads in the Smithsonian Grounds was resurfaced with bitulithic macadam. New walks were laid out and other changes made in Garfield Park.

A new and improved system of lighting the parks was adopted and its installation nearly completed; 6,323 feet of water pipe and 3,240 feet of drain pipe were laid; 2,096 square yards of cement walk and 353 linear feet of cement curbing were laid; 620 square yards of asphalt walk, 127 square yards of bituminous macadam walk, and 104 square yards of brick walk were constructed, and 140 square yards of asphalt road and 935 square yards of asphalt walk were repaired; 3,401 feet of coping were built around 12 reservations; 2,600 square yards of gravel roads were surfaced with bitulithic macadam, and 7,800 square yards of old macadam roads were similarly resurfaced; 3,216 square yards of bitulithic macadam roads were constructed; 3,450 square yards of macadam roads were oiled for the first time, 103,000 square yards were oiled for the third time, and 20,000 square yards were oiled for the fourth time, the other applications having been given in previous years; 9,808 square yards were surface treated with coal tar for the first time, 25,730 square yards were given a second application, and 3,400 square yards a third application, the other applications having been given in previous years; 5,700 square yards of macadam road in the White House grounds were surface treated with sulphite liquid for the first time;

143 park benches were repaired and 252 were repainted; 1,100 cubic yards of stable manure were used upon lawns and for mulching around shrubs and young trees; 45 tons of shredded cattle manure, 150 barrels of air-slaked lime, and 10 tons of bone meal were also used on lawns; an iron post-and-chain fence was placed along the west side of Garfield Park; the iron post-and-chain fence around one reservation was taken down and removed and replaced with cement coping.

At the Washington Monument all the iron and wood work in the shaft were painted and new sash were made and painted for the windows at the top.

At the propagating gardens the various greenhouse structures were repaired as far as funds would permit. The superstructure of one house was entirely reconstructed. The superstructures of three other houses were taken down and one new superstructure erected to cover the area formerly covered by the three. A windstorm in July wrecked the superstructure of a palm house. This was reerected, glazed, and painted. Over 670,000 plants were propagated, of which nearly 630,000 were planted in the parks and reservations.

At the house where Abraham Lincoln died miscellaneous repairs were made, including some painting.

Inspections were made each month of the buildings occupied as offices by the War Department, except the State, War and Navy Department Building, so far as their preservation, care, and safety are concerned.

Considerable painting was done to the ironwork of the Highway Bridge across the Potomac River, D. C. Repairs were made to the asphalt roadway on the bridge, and also to the granitoid pavement on the approaches, a portion of the latter work having been done by the contractors who laid the pavement under the guaranty clause in their contract.

Repairs were made to the post-and-wire fence along either side of the road leading from the Government wharf to the monument at the birthplace of Washington, at Wakefield, Va. The brush along this roadway was cut. On the night of January 19–20 18 spans of the wharf were destroyed by ice. There now remain only 37 spans of the 69 that were constructed.

The monument to John Paul Jones was erected, completed, and unveiled, and the memorial to Christopher Columbus was also erected and unveiled, but not quite completed, some dressing of the stones of the pedestal being still required. The Artillery group for the memorial to Gen. Ulysses S. Grant was cast in bronze and placed in position upon its pedestal. A contract was entered into for the construction and erection of the statue of Commodore John Barry, and the half-size clay model of the figure of "Victory" for the pedestal has been completed by the sculptor, who is also the contractor, and approved by the Commission of Fine Arts.

Attention is invited to the detailed report of the officer in charge and to his estimates and recommendations for the fiscal year ending June 30, 1914.

The estimates are as follows:

For the improvement and care of public buildings and grounds in charge of the Chief of Engineers	$372,070
For compensation of persons employed by Office of Public Buildings and Grounds	79,790

Telegraph to connect the Capitol with the departments and Government Printing Office. For care and repair of existing lines, including prining, binding, and blank books		$500
For contingent and incidental expenses of public buildings and grounds		3,900
For the care and maintenance of the Washington Monument:		
Salaries of employees	$8,820	
Fuel, lights, printing, binding, blank books, contingencies, etc	3,000	
		11,820
For maintenance of highway bridge across Potomac River, D. C		16,480
Improvements, birthplace of Washington, Wakefield, Va. For repairs to fences and cleaning up and maintaining grounds about the monument		100

(See Appendix E E E.)

SURVEY OF NORTHERN AND NORTHWESTERN LAKES.

Officer in charge, Lieut. Col. C. S. Riché, Corps of Engineers.

As early as 1816 local surveys of the Great Lakes for special purposes were made by engineer officers, but the "Lake Survey" as a systematic work was commenced in 1841. It was diligently prosecuted thereafter until 1882, when for a time extended field operations were suspended. The correction, printing, sale, and issue of charts continued without cessation, however, the additions and corrections being largely based upon local surveys and reports by engineer officers in charge of the river and harbor improvements on the Lakes.

Systematic field work was resumed in 1889, and has since been prosecuted with increased vigor. In 1898 operations were extended to include cognate work of observing and investigating the levels of the Great Lakes and their connecting waters, with a view to their regulation in the interest of commerce. The survey proper has from the beginning been carried on under the War Department, being at first conducted by the Chief of Topographical Engineers, and by the Chief of Engineers after the consolidation of the Topographical Engineers with the Corps of Engineers.

The first regular appropriation for the Lake Survey was made in 1841, and annual appropriations followed with the single exception of 1847. The appropriations to date for all purposes of the survey during the 70 years of its existence aggregate $4,561,879, of which $2,411.81 has reverted to the Treasury.

A full account of the operations of the Lake Survey from May, 1841, to July 1, 1881, is contained in Professional Papers, Corps of Engineers, United States Army, No. 24, which describes in detail the methods of primary triangulation employed. An extract from this publication describing the condition of lake navigation in 1841 is printed in the Annual Report of the Chief of Engineers for 1910, page 1043.

The early operations of the Lake Survey seem to have been conducted with a view to meeting the demands of a limited navigation where the greatest draft was 12 feet. With the expansion of lake commerce, the increase in vessel dimensions, and the creation of channels and harbors with progressively increasing depths, the Lake Survey has kept pace with the increasing demands by a corresponding extension of the scope of its operations. The earlier work, however, has not been lost. The highest attainable standards of accuracy and excellence have characterized the work from the beginning, and the work now in progress under present approved projects is merely an extension of the earlier work to limits which were not anticipated by the most sanguine spirits of former days.

The present general project of the Lake Survey is stated in much detail in the annual report for 1907, pages 844 to 850. This describes the work regarded as necessary in order to render the surveys and the charts of the Lake Survey adequate to respond to all probable future demands. This general project proposes the ascertainment and charting of lake depths in all significant regions of the Great Lakes to a plane 30 feet below the adopted low-water datum of the open lakes and 25 feet below the corresponding datum in the channels of the connecting rivers, together with the completion of the related operations of triangulation and precise leveling still needed to control properly the areas under survey. In addition, this general project provides for the extension of river-discharge measurements, for investigations of lake levels, and for magnetic surveys in and near main vessel courses, while prompt examination of areas where obstructions to navigation have been reported will be continued as heretofore.

The water area charted is about 95,000 square miles, of which about two-thirds is on the American side of the international boundary. The shore line is about 8,345 miles in length, and of this the American line is 4,700 miles. As a basis of comparison, the total shore line of the Atlantic, Pacific, and Mexican seaboards of the United States, excluding Alaska and all islands, is stated in Senate Document No. 74, Fifty-third Congress, second session, to be 5,705 miles long. These figures are, however, somewhat elastic, as the measurement varies with the closeness with which the sinuous shore line is followed. The work of the survey has not been limited by the national boundary, as the predominance of the navigation interests of the United States, amounting to 95 per cent of the commerce of the lakes, has warranted surveys extending to those parts of the main traveled vessel tracks passing through Canadian waters. Canadian shore line has also been surveyed where the delineation of these shores is essential to the integrity of navigation charts, as along rivers and where vessel courses lay close to Canadian territory.

On the assumption that adequate appropriations would be provided, it has been estimated that the general Lake Survey project will be completed in seven seasons' work, including that of 1912. Since that estimate was made, the scope of operations has been enlarged by the act of Congress approved March 4, 1911, wherein it was provided that the survey of the northern and northwestern lakes should be extended to include the natural navigable waters of the New York canals. The additional work involved will probably lengthen the time required for the completion of the project, unless appropriations are correspondingly increased.

After the completion of the project, the maintenance of a small equipment and organization will be required for such minor surveys as may be needed to observe and verify natural changes and to investigate wrecks and other artificial obstructions and to keep up the revision and issue of charts.

The amount expended on all surveys made since its inception by the Lake Survey may, with propriety, be regarded as the expenditure under the present project. This amount is $4,550,292.59, including the amount covered by existing contracts. (See summary of Appropriations and Expenditures, Appendix F F F 1.)

This total also includes the expenditure for surveying and charting the lakes and other natural navigable waters embraced in the navigation system of the New York canals. The expenditure for this purpose during the fiscal year, (which is also the total expended on that work to date) was $2,600.

The state of the field work of the Lake Survey on the Great Lakes and connecting rivers, which includes operations of triangulation, topography precise leveling, ordinary sounding, deep-sea sounding, sweeping, hydraulic measurement, and magnetic observations, is estimated, on June 30, 1912, to be as follows: Triangulation, 85 per cent completed; topography, 70 per cent completed; precise leveling, 64 per cent completed; ordinary sounding 62 per cent, and deep-sea sounding 15 per cent; sweeping, 51 per cent; hydraulic measurement, 94 per cent; and magnetic observations, 94 per cent completed on land and 35 per cent on water. While progress toward completion of these branches of the work may thus be definitely stated, the issue of charts, perhaps the most important duty of the Lake Survey, is a continuous function, increasing in importance with the growth of the lake commerce and subject to constantly increasing demands.

On July 1, 1911, five parties were engaged in field operations as follows:

The first party was employed in the east end of Lake Erie, continuing the general resurveys in that vicinity, which, when completed, will cover the waters and adjacent shores easterly of Point Abino and Sturgeon Point to the vicinity of Niagara Falls, there to connect with the resurvey of the lower Niagara River completed in 1906. Control for the lake area was determined from the primary triangulation of 1872, and new stations were established at Point Abino, Windmill Point, and Myer, and all permanent lighthouses and many other prominent structures were located geodetically. The area to the northward of the 1910 work was swept into the 18-foot contour from the west side of Point Abino to a point southerly of Erie Beach, thence to the north entrance of Buffalo Harbor and along the breakwater to the south entrance. The total area covered was about 52 square miles, making the total area investigated with the sweep in this end of the lake about 101 square miles. Seneca and Waverly Shoals were minutely sounded in addition to being swept for least depths. Several important rock shoals were discovered during the progress of the work, and these have been made the subject of special notices to mariners and have received prominent mention in bulletin and supplements. During the year topography has been taken between Eighteen Mile Creek and Sturgeon Point, from Point Abino to about 1 mile below Black Creek, for a distance of 2 miles along the west side of Grand Island below Elmwood Beach, and from Squaw Island to three-fourths of a mile below the northerly city limits of Buffalo. The belt of topography along all lake and river shores covered about one-half mile in width. The total area for the year was about 26½ square miles. Owing to the unusually rough weather at the close of the 1911 field season, a satisfactory completion of the hydrography in the open lake was not accomplished, the careful examination of several newly discovered shoals being deferred until the following spring. The field work of this party was discontinued on November 14, 1912.

The second party was engaged upon the continuation of the resurveys along the west shore of Lake Michigan, being employed at the beginning of the year in the vicinity of Waukegan, Ill. The survey was extended to the northward until October 23, completing the hydrographic work to the vicinity of Racine, Wis., and the topography to a point about 1 mile north of Wind Point Lighthouse. Three important shoals were discovered between Highland Park and Glencoe, Ill., beside several unchartered shoals of minor importance. An area of 180 square miles was swept during the field season of 1911. The topography of the adjacent shore, which was taken during weather unfit for lake work, covered a total area of 35 square miles. Control was established by means of water triangulation extended northward from the vicinity of Ravinia Park to Racine, with a tie at Waukegan for position and at Kenosha for position, azimuth, and length. The checks at these points were satisfactory. The party, en route to Detroit after discontinuing work in the vicinity of Racine, made special examinations at South Point, Milwaukee, for an obstruction reported by the master of the steamer *Racine*, and in Grays Reef Passage for a shoal encountered during the season of 1911 by the steamer *Hanna*. Results of these examinations were specially reported in subsequent supplements to the Lake Survey annual bulletin. In addition, a minor survey was made at Algoma Harbor, Wis., and four automatic gauges were inspected on the homeward trip, the party arriving at Detroit, Mich., on November 5, 1911.

A third party was engaged at the beginning of the year in the vicinity of Thunder Bay, Lake Huron, extending the resurveys southward along the westerly shore of that lake. The hydrography, covering a belt 5 miles in width, was advanced to about 4 miles south of Harrisville, Mich., where work was temporarily suspended in order to avoid the rough fall weather for open-lake work. During the latter part of the season this party was engaged on hydrographic surveys at the mouth of Saginaw Bay. The season's work resulted in the discovery of several important shoals in the vicinity of Alcona, Sturgeon Point, and Harrisville, in addition to the location, throughout the length of the survey, of many rocks and reefs which happen to be of minor importance on account of their proximity to the shoal water along the shore. The results obtained by this party in its season's hydrographic work are exceedingly satisfactory, both as to quality and quantity; and they afford another excellent illustration of the superiority of the sweeping method whereby many shoals were found which were not disclosed by the close sounding of the original survey. The control for the 1911 work was determined through close ties with the primary triangulation, either by water triangulation or by supplementary points directly located from the primary stations. The season's field work for this party was suspended on November 8, 1911.

The fourth party at the beginning of the year was finishing the early summer's discharge measurements on the St. Lawrence River. The program for this work contemplated two series of measurements to be made during the high spring stage and the low fall stage, respectively, to supplement the measurements of 1908 in determining a new discharge curve, the law formulated by the results of previous measurements having been modified by artificial changes in the upper river. The hydraulic party was assigned, during mid-season, to assist on the general resurvey of the east end of Lake Erie and the upper Niagara River, and was so employed from July 10 to September 23, 1911. Work of this party was confined to the Niagara River, extending the hydrography and topography.upstream from the vicinity of Welland River, the termination of the resurvey of the lower Niagara River completed in 1906. Hydrography was completed to Sheenwater in the Canadian Channel and to a point 1½ miles above Cayuga Island in the American Channel. Topography was taken along 17 miles of shore line from the Welland River up the American Channel to Buckhorn Island and up both sides of the Canadian Channel to Sheenwater. Control was obtained from the triangulation of the International Waterways Commission. Hydraulic work on the St. Lawrence River was resumed on October 1 and continued until the close of the field season.

Preliminary operations on the survey of the New York State canals, as provided for in the act of Congress approved March 4, 1911, were continued during July, 1911, by the assembling of field notes and maps of the Deep Waterways Commission, and of the New York State surveys, and on August 2 an assistant was dispatched to Albany, N. Y., for the purpose of examining the records of the New York State Barge Canal surveys to obtain pertinent data from that service. Field work was begun on August 11 in the vicinity of Oneida Lake, N. Y., and a small party was employed until November 20, 1911, in connecting the control stations of the old surveys to the New York State primary triangulation, and in supplementing these surveys by revision and extension of the topography and by the development of a system of secondary triangulation along the lake for the control of the hydrography. The Oneida Lake chart, which will be the first prepared under the project, will require new hydrogrpahy throughout, located from a new system of triangulation, and considerable topography to revise and supplement that of the old surveys. During the 1911 season triangulation stations were located and monumented along the entire length of the Oneida Lake survey. Somewhat more than one-half the angle reading for this system was completed, and slightly less than one-half the necessary topographic data for the proposed chart was obtained.

A magnetic survey on the waters and along the shores of Lake Huron was undertaken by a sixth party, which left Detroit on July 5, 1911. By the methods outlined on page 3016, Chief of Engineers Report for 1911, observations for magnetic declination were taken from the steamer while navigating from port to port across the lake. The party remained in the field until October 12, completing the proposed program of observations for Lake Huron.

During the present field season four parties have been assigned to field duty.

The first party on May 22 began an investigation in the vicinity of Grecian Shoal, Lake Erie, with a view of locating an obstruction encountered by the steamer *Bethlehem* on November 13, 1911. An area of nine square miles was swept at and near the reported location without any important discovery. This party then resumed the resurvey of the east end of Lake Erie in the vicinity of Buffalo, N. Y., completing the hydrography to the head of Niagara River on June 27. At the end of the fiscal year the party was en route to the eastern end of Lake Ontario.

The second party resumed the surveys along the west coast of Lake Michigan on May 23, and at the end of the year was stationed at Racine, Wis. The hydrography has been completed northward to the vicinity of Wind Point and the topography to the southerly limits of South Milwaukee.

The third party left Detroit, Mich., on May 16, 1912, to continue hydrographic surveys southward along the west coast of Lake Huron. Operations were begun in the mouth of Saginaw Bay to the southward and eastward of the previous season's work. On June 22 this party shifted its scene of operations to the vicinity of Harrisville, Mich., and was engaged on hydrographic work southward of the 1911 surveys at the close of the year.

A small party located at Port Huron, Mich., was employed during the last week in June in monumenting stations of a triangulation system executed by the International Waterways Commission along the upper St. Clair River to perpetuate these points for future use of the Lake Survey.

In addition to the field work above mentioned, operations were continued under the present general project for the exhaustive investigation of lake levels, this being in continuation and extension of the project outlined in the annual report for 1898, pages 3774–3776. The principal field work of the year comprised lake temperature observations and the maintenance of one staff and 10 self-registering gauges to supply accurate, continuous records of all changes in elevation of the water surfaces on the lakes and rivers. Appendix F F F 1 of this report gives a table of discharges for all of the Great Lakes at the mean stage of each for the past 52 years as determined by the standard gauges. This work is now fully organized, methods of making measurements and observations to the best advantage have become fixed and settled, and the results are of increasing importance, bearing, as they do, on questions affecting international relations and obligations, and on the propriety and advisability of the numerous diversions under consideration. A table showing the monthly water levels from July 1, 1911, to June 30, 1912, at Marquette, Mich., on Lake Superior; Milwaukee, Wis., on Lake Michigan; Harbor Beach, Mich., on Lake Huron; Cleveland, Ohio, on Lake Erie; and Oswego, N. Y., on Lake Ontario, will be found in Appendix F F F 1.

The execution of the survey which terminated in 1882 involved a great quantity of astronomic, topographic, and hydrographic work, all of which was performed with a high degree of accuracy and skill. The result was the preparation of a series of reliable charts for lake vessels and the furnishing of a basis for works of channel improvement upon the lakes themselves and their connecting waters. This original series consisted of 76 charts, all of which were printed in black from copperplates.

At the present time the chart work of the Lake Survey is that covered by project approved April 17, 1909, printed upon page 937, Report of the Chief of Engineers for 1909. When completed, due to changes and omissions contemplated by this project, the Lake Survey series will comprise about 104 separate charts, this number, however, being approximate, as circumstances may arise in the future necessitating the retention of some of the harbor charts as separate publications, instead of insets as now planned.

As a result of revisions, cancellations, and additions to the original series, based on the later surveys, there are now in force 120 Lake Survey charts, of which 1 is in black from old copperplate, 79 are lithographs in colors from copperplate transfers, and 40 are lithographs in colors from stone engravings.

The charts issued in colors have all depths of 18 or 21 feet and less in blue, showing at a glance where vessels may proceed with safety, and are considered by vessel men much preferable to the old style printed in plain black and white. This series of colored charts is believed to constitute a distinct advance in chart construction and printing, and meets with high favor from navigators and others.

During the year the Lake Survey office revised, transferred to stone, and printed editions in colors from 12 copperplates, and revised and printed editions from 6 engravings on stone. Five entirely new charts, engraved on stone and issued in colors, were also published. Every chart sent out was, as far as practicable, corrected for all information received to the day of issue. A magnetic chart of Lake Huron, and charts of Grays Reef Passage and Lower Detroit River showing recent changes, were published as insets in supplements to bulletin No. 21.

The progress of operations under the project for chart revision approved April 17, 1909, is as follows:

	Existing series.	Final edition.
Number of charts in force June 30, 1912	120	
Number of charts contemplated for final edition, by revision and consolidation of existing series and construction of new charts		111
Number of new charts or charts completely revised	60	
One of the number will eventually be made an inset on another chart and a second will be superseded and dropped, leaving number of new charts or charts completely revised for final edition		58
Number of charts under revision	9	9
Number of charts to be revised, in whole or part, and issued as separate charts [1]	35	35
Number of charts to be revised and issued as insets	4	
Number of charts to be dropped	12	
Number of new charts in course of preparation		4
Additional new charts proposed		5
Total	120	111

[1] Eighteen of the charts to be revised, in whole or in part, have already been revised for geographic positions and 17 others have been revised for hydrography. Including those partially revised and the new charts and the charts completely revised, the total number of the series now in force, based on the standard geodetic datum, is 78, and the total number based on the standard datum for hydrography is 77, making a total of 95 charts either new, completely revised, or partially revised.

Of the entire series of Lake Survey charts there had been issued in colors 5 on July 1, 1900; 12 on July 1, 1901; 30 on July 1, 1902; 49 on July 1, 1903; 59 on July 1, 1904; 73 on July 1, 1905; 97 on July 1, 1906; 110 on July 1, 1907; 117 on July 1, 1908; 122 on July 1, 1909; 124 on July 1, 1910; 126 on July 1, 1911; and 124 on July 1, 1912, including the 5 general charts formerly published by the Hydrographic Office of the Navy and which are now published and sold by the Lake Survey office.

The reduction of the number of charts in colors from 126, June 30, 1911, to 124, June 30, 1912, is accounted for by the dropping of 5 old charts superseded by the work of revision under the chart project, and the issuance of 3 new charts. When the chart project was approved, it was expected, as previously stated, to reduce the total number of charts eventually to about 104. The present indications are that it will probably be more advantageous to reduce the number to 111 instead of to 104.

Up to February 20, 1890, one full set of charts was issued free to each United States registered vessel. Any additional charts furnished such vessels and all furnished for other unofficial use were sold at the uniform price of 30 cents each. On the date above mentioned the free issue, except for official purposes of the Government, was discontinued pursuant to law, and since then the charts have been sold for all private and unofficial use at prices ranging from 5 cents to 30 cents each, the price being intended in each instance to cover only the cost of paper and printing.

Charts may be purchased at the main office at Detroit, at the canal office at Sault Ste. Marie, Mich., and at the United States engineer office in Buffalo. Complete sample sets may be seen at the United States engineer offices at Duluth, Milwaukee, Chicago, Grand Rapids, Cleveland, and Oswego, enabling purchasers to select exactly the charts they wish to order.

From 1882 to June 30, 1912, a total sum of $43,215.24 was derived from the sale of charts at offices where they were sold and deposited in the United States Treasury.

During the fiscal year ending June 30, 1912, the number of charts sold by the Detroit office was 13,621, and by the Buffalo office 2,506, the aggregate sales being 16,127. The proceeds of the sales, amounting to $2,509.95, were deposited to the credit of the Treasurer of the United States. The Detroit office issued 3,156 charts for official use and the Buffalo office 55, a total of 3,211. To date about 443,770 of these charts have been sold and issued for actual service.

For other Government offices one chart was printed in colors. For the Chief of Engineer's office (under appropriation "Maps, War Department"), the following were reproduced and printed: Four harbor charts and ten different protractor variants of these charts; topographical map of northeast Virginia, in black; Petersburg and Five Forks, in colors; three maps illustrating the three days' Battle of Gettysburg, in colors; and 7 military maneuver ground maps, four in black and three in colors. The engraving on copper of three sheets of the military survey of Luzon, Philippine Islands, is in progress. Also operations were in progress upon the revision of eight copperplates and one stone engraving for the publication of new editions of old charts, and the engraving on stone of four new charts of the regular Lake Survey series.

The preparation and issue of the series of bulletins supplementary to the charts, relating to the river and harbor improvements and navigation of the Great Lakes, was begun by this office in 1889 and was transferred to the office of the Lake Survey at Detroit in 1902. These bulletins are issued annually, with monthly supplements during the season of navigation, and give the latest and fullest descriptions of progress in river and harbor improvements on the Great Lakes and their connecting waters, as well as significant results of surveys in those waters made under the direction of district engineer officers and of the Lake Survey. If deemed helpful, small maps showing location of new shoals, changes in important channels, localities hitherto uncharted, etc., are inserted in both bulletins and supplements.

Supplements Nos. 3 to 7, Bulletin No. 20, were issued between July and November of the season of 1911. Bulletin No. 21 and Supplements Nos. 1 and 2 were issued between April and June of the 1912 season.

The commerce affected by the operations of the Lake Survey and depending upon the publication and constant revision of charts and bulletins is practically the entire commerce of the Great Lakes. To keep pace with the needs of this rapidly growing traffic requires that the present organization and plant be operated to their utmost capacity during the relatively short seasons available for field work. The greatly increased demand for lake charts and the publication by the Lake Survey of the Mercator charts of the Hydrographic Office, United States Navy (5 general charts of the Lakes), have materially increased the office operations. In order that the additional cost of chart preparation and the extension of operations to include the New York canals may not hamper the important field work on the Great Lakes, it is recommended that an appropriation of $150,000 be made for the fiscal year ending June 30, 1914, and that it be formulated as follows:

Estimate for the fiscal year ending June 30, 1914.

For survey of northern and northwestern lakes, including printing, binding, and blank books, and all necessary expenses for preparing, correcting, extending, printing, binding, and issuing charts and bulletins, and of investigating lake levels with a view to their regulation, to be immediately available and to remain available until expended: *Provided*, That the survey of said northern and northwestern lakes be extended so as to include the lakes and other natural navigable waters embraced in the navigation system of the "New York canals"	$150,000.00

Money statement.

July 1, 1911, balance unexpended (Chief of Engineers report, 1911)		$130,842.36
Collections credited to account: Reimbursements on account of work done for other engineer districts		515.93
		131,358.29
June 30, 1912, amount expended during fiscal year:		
At office of Chief of Engineers	$1,760.00	
At U. S. Lake Survey Office	[1] 120,413.19	
At U. S. Engineer Office, Buffalo	10.50	
		122,183.69
July 1, 1912, balance unexpended		9,174.60
July 1, 1912, outstanding liabilities	6,599.06	
July 1, 1912, amount covered by existing contracts	260.24	
		6,859.30
July 1, 1912, balance available		2,315.30

(See Appendix F F F 1.)

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[1] This amount includes expenditures of $515.93 which were reimbursed as above stated.

PRESERVATION OF NIAGARA FALLS.

The act of Congress approved June 29, 1906, "For the control and regulation of the waters of Niagara River, for the preservation of Niagara Falls, and for other purposes," authorized the Secretary of War, in his discretion, to grant permits for the diversion of water on the American side for power purposes, up to a limit of 15,600 cubic feet per second, and permits for the transmission of electrical power from Canada up to a limit of 160,000 horsepower. The act further authorized the granting of similar permits "For the diversion of additional amounts of water from the said river or its tributaries to such amount, if any, as in connection with the amount diverted on the Canadian side shall not injure or interfere with the navigable capacity of said river or its integrity and proper volume as a boundary stream or the scenic grandeur of Niagara Falls." On the recommendation of the Chief of Engineers, the study of the technical questions involved, requiring surveys and hydraulic measurements similar to those ordinarily made by the Lake Survey, was assigned by the Secretary of War on March 20, 1907, to the officer in charge of that survey, and various successive allotments have been made to defray the expenses of the investigations.

In 1906, previous to this assignment, the Lake Survey had initiated the study of hydraulic conditions in the Niagara River in connection with surveys for chart purposes in the vicinity of Niagara Falls, which work is briefly described on pages 2457–2458, Annual Report of the Chief of Engineers for 1907. Subsequent observations and measurements have been made to compare the more recent law of outflow of the Niagara River with that determined in 1898–1900, to determine the volume of diversions in the canals of the power companies on the American side and in the Erie Canal with the corresponding development of power, to derive equivalent lake and river heights, to determine current lines, depths, and contours in and above the rapids, to observe the effect of diversions on the depths over the Falls and on the continuity of their crest lines, and for other related studies.

The principal results of the work under the general project were submitted in a special report dated November 30, 1908, and in a supplementary report dated September 21, 1909, which contain detailed accounts of the investigations above outlined. These reports are published in Senate Document No. 105, Sixty-second Congress, first session. A comprehensive report summarizing and supplementing the above reports and containing a narrative history of the operations of the United States Lake Survey under appropriation "Preservation of Niagara Falls" from June 29, 1906, to June 29, 1911, was submitted by that office under date of September 30, 1911, and was published in House Document No. 246, Sixty-second Congress, second session.

The act of June 29, 1906, expired by limitation on June 29, 1911, and operations under the appropriation were then temporarily suspended. The provisions of the act were extended to March 1, 1912, by joint resolution of Congress approved August 22, 1911, and were again extended to March 4, 1913, by joint resolution of Congress approved April 5, 1912. Operations have been continued during the year except for the periods during which the law lapsed.

The permits granted by the Secretary of War under the provisions of the act of Congress of June 29, 1906, authorized an aggregate diversion of 15,600 cubic feet of water per second on the American side for power purposes, and the transmission from Canada of an aggregate of 158,500 electrical horsepower. They are briefly summarized on page 895 of the Annual Report of the Chief of Engineers for 1908. On August 16, 1907, the supervision of the operations of the power companies thereunder was assigned by the Secretary of War to Capt. (now Maj.) C. W. Kutz, Corps of Engineers, and on August 14, 1908, upon the departure of Capt. Kutz to a new field of operations, the duty was transferred by him to the officer in charge of the survey of the northern and northwestern lakes. This duty has continued to the end of the last fiscal year, except during the intervals from June 29 to September 11, 1911, and from March 1 to April 27, 1912, these being the periods in each case between the expiration of the law and the receipt by the officer in charge of the work of supervision of official notification to resume operations.

The power plants of the several companies concerned have been frequently inspected and the detailed results of such inspections have been placed on file in the Lake Survey Office, and summaries duly reported to the Chief of Engineers. During the year three separate inspections of the power stations of the Niagara Falls Hydraulic Power & Manufacturing Co. have indicated diversions of water in excess of the maximum allowance under its permit. On the two earlier occasions—December 14, 1911, and January 3, 1912—the company was without the limitation of switchboard output which was later prescribed, and its estimated consumption of water was then based on its own values of the efficiency of its plant. Measurements of flow in the company's canal which were made by the Lake Survey December 1–8, 1911, and reduced in January, 1912, gave somewhat lower values for the efficiency of development than those derived by the company, and it was by the Lake Survey values that the consumption of water was determined to be excessive. In view of the fact that the violation of its permit was apparently unintentional, the Secretary of War, under date of February 28, 1912, concurred in the recommendation that no action in these instances be taken against this company under section 3 of the act of June 29, 1906. The third instance wherein the diversion of water was indicated to be in excess of the maximum amount of the permit occurred on May 14, 1912, after the permissible switchboard output had been prescribed. Federal action regarding this excessive diversion is now under consideration by the Secretary of War. Except in the cases above cited, the inspections indicate that all power and transmission companies have loyally observed the limitations of their respective permits during the past year.

The Niagara Falls Power Co. has continued the remodeling of generating units in its power house No. 1 by the installation of new turbines and the addition of draft tubes. The rebuilt units are essentially identical with unit No. 10 in power house No. 1, the remodeling of which was noted on page 1113, Annual Report of the Chief of Engineers for 1911. To verify the tests and deductions made during the previous year the Lake Survey Office, in October, 1911, cooperated with the power company in repeating these tests on units Nos. 9 and

10. The results were in accordance with those of the previous tests giving efficiencies for the remodeled units of practically the same value as the efficiencies of the units in power station No. 2. In response to a request from the company, an amended table of switchboard limitations similar in form to the one published on page 2724, Annual Report of the Chief of Engineers for 1910, was made effective October 10, 1911. This second amendment of the original restrictions was made for the purpose of giving to the company the benefit of the increased efficiency of its plant, due to the remodeling of the second unit in power house No. 1. The table was issued for temporary use, pending the results of new efficiency tests. These tests proved satisfactory, and another table was immediately prepared which will accommodate conditions during and succeeding the remodeling of all units in power station No. 1. This last table will be found in Appendix F F F 2. The restrictions on permissible switchboard output prescribed by the several tables which have been issued, are based on the efficiency curves derived from the measurements of 1909, the derivation of which is explained in the special report of September 21, 1909, published in Senate Document No. 105, Sixty-second Congress, first session. The remodeled generating units are considered equivalent in efficiency to the units in station No. 2.

As the diversions of the Niagara Falls Hydraulic Power and Manufacturing Co. were rapidly approaching the limit allowed by its permit from the Secretary of War, measurements of flow in the company's canal were made in December, 1911, to verify the estimated diversion and to determine the relation between the consumption of water and the output of power in order that restrictions in terms of switchboard output corresponding to allowable diversion could be formulated as a means to easy and effective supervision. Twenty-five independent measurements were made during which simultaneous switchboard readings were taken in both power stations. Owing to the operating conditions, it was not practicable to greatly vary the output, and accordingly it was not possible to determine efficiency curves covering a wide range of conditions. The results, however, give a closely accurate relationship between the consumption of water and the power output for the operating conditions at the time of measurement, and it was determined that for such conditions an aggregate output from the two power stations of 78,200 kilowatts represents the allowable use of water by this company under its permit, after deducting the amount of water used in mills of tenant companies. This restriction, which was informally communicated to the company on January 13, 1912, was later approved by the Secretary of War and will continue as a measure of operating limitations for this company during the life of its present permit or until such time as material improvement in the efficiency of development has been demonstrated.

The operations during the fiscal year, additional to the supervision of power and transmission companies, consisted largely in continued study of slope relations and the effects of continually increasing diversions upon lake and river heights and upon the integrity of the falls. Several special reports were prepared in the Lake Survey Office during the year on this and other subjects pertaining to preservation of Niagara Falls.

A public hearing was held in Detroit, Mich., on February 1, 1912, concerning the application of the Federal Light & Power Co., of

Detroit, Mich., for permission from the Secretary of War to receive at the international boundary in the Detroit River and to transmit into Detroit, Mich., electrical power generated in the Dominion of Canada from waters of the Niagara River. Action on this application is still pending.

Owing to the anticipated termination on June 29, 1911, of the act pertaining to the preservation of Niagara Falls, and in view of the uncertainty of subsequent legislation by Congress, gauges were not established on the Niagara River for the 1911 season. River levels are being recorded during the present season by five automatic gauges reestablished at critical points above and below the Falls, and the records of these will afford valuable data for the continued study of river slopes.

During the fiscal year the following allotments have been made from the appropriation of June 29, 1906, for the purpose of defraying the expenses arising in connection with the supervision of power and transmission companies and with the investigation of slopes in the Niagara River and related subjects, and for the expenses of the Niagara Falls committee: August 11, 1911, $710.88; September 13, 1911, $500; November 9, 1911, $1,000; January 6, 1912, $500; March 27, 1912, $137.14; and April 26, 1912, $500.

Appropriated by act of June 29, 1906	$50,000.00
July 1, 1911, balance unexpended	25,037.27
June 30, 1912, amount expended during fiscal year	3,655.43
July 1, 1912, balance unexpended	21,381.84
July 1, 1912, outstanding liabilities	11.12
Balance of appropriation unused	21,370.72

(See Appendix F F F 2.)

IMPROVEMENT OF YELLOWSTONE NATIONAL PARK, INCLUDING THE CONSTRUCTION, REPAIR, AND MAINTENANCE OF ROADS AND BRIDGES.

Officer in charge: Capt. C. H. Knight, Corps of Engineers.

The Yellowstone National Park was set apart from the public domain and placed under the control of the Secretary of the Interior by act of Congress of March 1, 1872. The sundry civil act of March 3, 1883, directed the construction and improvement of suitable roads and bridges under the supervision of an engineer officer to be detailed by the Secretary of War, and in July, 1883, an engineer officer was designated accordingly. This was the beginning of systematic road construction in the park. The previous work consisted of the opening of such rough trails as the limited means permitted, but they were temporary in character and of little or no value in the permanent plan. Subsequent to the sundry civil act of August 4, 1886, the expenditure for the improvement was transferred to the War Department, and it has since been in the charge of the Engineer Department, with the exception of the period from August, 1894, to March, 1899.

At the outset the officer of the Corps of Engineers in charge adopted a project (described in the Annual Report of the Chief of Engineers for 1887, p. 3134) for a comprehensive system of substantial roads, which, with the change of the act of Congress of March 3, 1891, is the basis of the present system. The sundry civil act of June 6, 1900, directed that the road extensions and improvements should thereafter be made in harmony with a general plan to be approved by the Chief of Engineers. Such plan was approved August 27, 1900, modified by the authority of the Secretary of War, dated July 22, 1901, and further modified by the approval of the Chief of Engineers, dated July 2, 1902. The sundry civil act of June 28, 1902, recognized this project and provided for its completion, and it was practically finished during the fiscal year ending June 30, 1906. The road system comprises a belt line or main circuit, which reaches all of the important centers of interest, with side roads, bridle trails, and four approaches leading from the park boundary to different points on the belt line; in all, about 350 miles of road and about 125 bridges. The present project provides that the belt line and the approach road from the north entrance be thoroughly metaled with crushed rock, gravel, or other good material; that iron pipe, tile, or other permanent material be used for culverts; that steel and concrete be used for bridges; and that roads on the main tourist route be sprinkled. Roads into the park, except from the north, are constructed and maintained as earth roads.

The sum expended to June 30, 1912, including maintenance and repairs, is $2,046,384.42. It is estimated that not less than $200,000 of this amount was expended in early work which has since been replaced and does not form a part of the completed system. Maintenance and repairs have cost about $731,001.37, leaving about $1,115,383.05 for the cost of the permanent work. In addition, there has been expended on work done for other departments the sum of $850.95, for which the park appropriation has been reimbursed.

For several years past the Annual Reports of the Chief of Engineers have called attention to the need for larger appropriations for maintaining the park improvements, for repairing the progressive deterioration of the road system, and for repairing and replacing old and unsafe structures. The experience of the past fiscal year well illustrates the practical impossibility of maintaining the road system in proper condition with the appropriations provided. The estimate submitted for the service of the fiscal year ending June 30, 1912, was $75,000, and, as was stated in a foot note on page 1055 of the Annual Report of the Chief of Engineers for 1910, the full amount of this estimate was needed to provide for maintenance, and made little or no provision for betterments.

The sundry civil act approved March 4, 1911, appropriated but $70,000 for the work during the fiscal year 1912, and provided furthermore that $2,500 of that sum, should be expended for maintenance of roads leading out of the park from the east and south boundaries. Conditions had reached a point where the safety of tourists had become a matter of grave concern and that appropriation was therefore carefully allotted with a view to replacing by safe structures certain old bridges which were considered menaces to life, and to repairing and maintaining the roadbed in safe condition, including the sprinkling of the roads, regarded as a part of maintenance work as well as a provision for the comfort of those who use them. The work accomplished included general repair and maintenance of the entire system, including the Cooke City, East, West, and South Roads; the construction of three steel bridges, and a number of small wooden bridges; repairs to bridges and culverts; the clearing of dead and fallen timber from the roadside; the sprinkling of 100 miles of road; the conversion of a number of pumping stations into gravity tanks, and the installation of hydraulic rams; repairs to sprinkling wagons, road graders, carts and other vehicles; and the maintenance of trees, shrubs, vines, and lawns. Sprinkling was continued as long as funds could be spared for the purpose and discontinued early in August, but only when the available balance remaining was reduced to an amount barely sufficient to pay the ordinary running expenses sufficient for the remainder of the fiscal year, and the cost of the new bridges contracted for and urgently needed. Immediately after sprinkling operations were stopped protests against such discontinuance were received from prominent persons and the President called for a special report on the matter. The engineer officer in local charge of the road work had already reported that the action was occasioned by lack of funds, and he stated furthermore, that rains had left the road in poor condition and that the suspension of sprinkling and the limitations on other works, due to the lack of funds, was likely to result in serious damage before the end of the tourist season and to leave the roads in poor shape to meet the winter storms. By oral direction of the Secretary of War a special estimate was prepared for continuing the work of sprinkling and for contingencies likely to arise before the next appropriation became available. The amount named was $12,000. The estimate was submitted to Congress, August 19, 1911, and was published in House Document No. 111, Sixty-second Congress, first session, but no appropriation was made.

On April 20, 1912, the acting superintendent of the park informed the Secretary of the Interior that the main entrance road, between Fort Yellowstone at Mammonth Hot Springs and the railroad station at Gardiner, Mont., would probably soon be closed, as the hillside was gradually slipping into the road. He further stated that it was absolutely necessary to keep that road open for the full year, and that to have it closed then when supplies for the summer were coming in for the park concessioners and for the military post would be a calamity. He also stated that the dangerous part had been kept open during the autumn and winter by the labor of troops, but that an immense amount of earth must be removed before the road would be safe to travel.

On April 30, 1912, the retaining wall and a portion of the road at the point in question slid into the river, leaving a passageway but 3 feet in width. As the engineer officer in charge of the road work was without means for restoring wagon communication between Fort Yellowstone and Gardiner, the acting superintendent of the park sent a detachment of 40 men from the fort and widened the passageway to 6½ feet. A detachment was also employed throughout the month of May in repairing the retaining wall and keeping the road cleared of rock and dirt at the point where the slide occurred.

May 15, 1912, a special supplemental estimate of $20,000 for emergency repairs to roads in the park was submitted to Congress. This estimate was published in House Document No. 761, Sixty-second Congress, second session, but no appropriation was made. In May the Interior Department allotted the sum of $500 for opening the *old wagon trail* between Fort Yellowstone and Gardiner. The work was executed under the direction of the engineer officer and completed on June 21.

No appropriation was made by Congress for the work during the fiscal year and there were no funds available in the hands of the engineer officer for opening the roads for the tourist season of 1912. The expenditures during the fiscal year for maintenance and repairs were $36,524.62 and for permanent work $22,713.88, a total expenditure of $59,238.50.

In response to a Senate resolution, dated April 2, 1912, directing the Secretary of War—

> to submit to the Senate as early as possible an estimate of the cost of construction of new roads or changes in the present roads in the Yellowstone National Park in order to permit of the use of automobiles and motorcycles therein without interfering with the present mode of travel in vehicles drawn by horses or other animals—

a report on the subject prepared by Capt. Knight was sent to Congress with a letter of the Acting Secretary of War, dated June 26, 1912. It was printed in Senate Document No. 871, Sixty-second Congress, second session. The estimated cost of construction of new roads for the purpose was $2,704,030 and for reconstruction of the existing road $2,264,670. The annual cost of maintenance was placed at $187,625 in case new roads are constructed, and at $112,886 if the existing roads are widened.

It is proposed to apply the $150,000 estimated as a profitable expenditure during the fiscal year ending June 30, 1914, to work of maintenance and repair, together with the replacing of certain wooden bridges with bridges of steel and concrete, the replacing of wooden culverts with culverts of vitrified pipe and of concrete, the sprinkling of the roads, the replacing of certain dry rubble walls with walls of rubble laid in mortar, and for the repair and improvement of the roads and bridges of the approaches in the forest reserves east and south of the park. The sum of $150,000 is the least which should be appropriated for the next fiscal year and practically all of that amount will be needed to place and maintain the existing road system in a safe condition, leaving little or nothing for betterments. The appropriations for the past seven years have proven entirely inadequate for maintenance, and the bad results are cumulative, so that the need for larger appropriations is more urgent each year. There is already urgent need for the immediate replacement of certain old and worn-out bridges which, in their present condition, are a positive menace to the lives of travelers, and the entire road surface is in a poor and worn-out condition and in need of a more thorough treatment than can be given with the small appropriations made during the past few years.

NOTE.—OFFICE CHIEF OF ENGINEERS, *September 30, 1912.*—The sundry civil act approved August 24, 1912, provided an appropriation of $100,000 for the usual work of maintenance and repair of improvements, including not to exceed $4,500 and $1,500 for the roads in the forest reserves leading out of the park from the east and south boundaries, respectively; and an additional appropriation of $77,000 for widening and improving surface of roads and for building bridges and culverts, from the belt-line road to the western border, from the Thumb Station to the southern border, and from the Lake Hotel Station to the eastern border, all within the park. The total estimated cost of widening and improving the surface of the park roads, including retaining and guard walls, bridges, and culverts, to permit the use of automobiles and motor cycles, as given in the report of Capt. C. H. Knight, Corps of Engineers, May 27, 1912, printed in Senate Document No. 871, Sixty-second Congress, second session, is $2,264,670, including $75,100 for the west approach, $96,000 for the south approach, and $168,000 for the east approach within the park and in the forest reserve. It is recommended that all appropriations for work be made immediately available and remain available until expended, on account of the shortness and uncertain character of the working seasons.

More extended information relating to previous operations is published in the annual reports of the Chief of Engineers, as follows:

1887, page 3133: A résumé of operations from 1883 to 1887.
1900, page 5420: A general résumé covering the period 1872–1900.
1900, page 5441: The general plan approved August 27, 1900.
1901, page 3797: Modification of 1901 in the general plan of August 27, 1900.
1903, page 2444: General description and technical details of work.
1905, following page 2822: Map of tourist routes.

July 1, 1911:	
Balance unexpended	$58,870.24
Amount received from sales	500.00
	59,370.24
June 30, 1912, amount expended during fiscal year	59,238.50
July 1, 1912, balance unexpended	131.74
July 1, 1912, outstanding liabilities	131.74
Amount that can be profitably expended during fiscal year ending June 30, 1914, for maintenance and repairs, including not to exceed $15,000 and $5,000 for the roads in the forest reserves leading out of the park from the east and south boundaries, respectively, including printing, binding, and blank books, to be immediately available and remain available until expended	125,000.00
Amount that can be profitably expended during fiscal year ending June 30, 1914, for continuing the work of widening and improving the roads, bridges, and culverts, including printing, binding, and blank books, from the Belt Line to the western, southern, and eastern borders, all within Yellowstone National Park, to make such roads suitable and safe for animal-drawn and motor-propelled vehicles, to be immediately available and remain available until expended	100,000.00

Appropriations.

Act.	Administration and protection.	Roads and bridges.	Total.
Total of appropriations to Dec. 31, 1902 (see H. Doc. No. 421, 57th Cong., 2d sess.)	$100,348.02	$1,008,586.23	$1,108,934.25
Mar. 3, 1903	5,000.00	250,000.00	255,000.00
Apr. 28, 1904	7,500.00	250,000.00	257,500.00
Mar. 3, 1905	7,500.00	133,000.00	140,500.00
June 30, 1906	7,500.00	55,000.00	62,500.00
Mar. 4, 1907	8,000.00	75,000.00	83,000.00
May 27, 1908	10,500.00	65,000.00	75,500.00
Mar. 4, 1909	8,000.00	65,000.00	73,000.00
June 25, 1910	8,500.00	75,000.00	83,500.00
Mar. 4, 1911	8,500.00	70,000.00	78,500.00
	171,348.02	2,046,586.23	2,217,934.25
Receipts from sales		551.15	551.15
	171,348.02	2,047,137.38	2,218,485.40
Received from other sources (see money statement, 1903, p. 2892)		210.00	210.00
Received from other sources (see money statement, 1904, p. 4178)		117.80	117.80
Received from other sources (see money statement, 1905, p. 2812)		523.15	523.15
Total	171,348.02	2,047,988.33	2,219,336.35
Less amount reverted to Treasury, July, 1904, appropriation 1901-2		621.22	621.22
Grand total	171,348.02	2,047,367.11	2,218,715.13

(See Appendix G G G.)

ROAD TO MOUNT RAINIER NATIONAL PARK.

Officer in charge, Maj. C. W. Kutz, Corps of Engineers, to July 31, 1911, and Maj. J. B. Cavanaugh, Corps of Engineers, from that date.

Prior to the commencement of operations an inferior road led into the park from the western boundary of the forest reserve to Longmire Springs, a distance of about 10½ miles, and rough trails extended thence to the Camp of the Clouds.

The sundry civil act of March 3, 1903, appropriated $10,000 for a survey of the most practicable route for a wagon road into the park and for commencing construction. An estimate of cost, amounting to $183,000.50, was submitted to Congress March 22, 1904, and printed in House Document No. 631, Fifty-eighth Congress, second session, and an appropriation for continuing construction was made in the sundry civil act of April 28, 1904. The project thus authorized by Congress and the one under which the work was executed contemplated the construction of a wagon road from the western boundary of the forest reserve to the Camp of the Clouds, a distance of about 25 miles.

The report of the field work of the original survey made in 1903 is printed in the Annual Report of the Chief of Engineers for 1904, page 4207. The general location of the proposed route is shown on the map of the survey made in 1904 for a proposed additional road into the park from the east, printed in House Document No. 283, Fifty-eight Congress, third session.

The cost of road construction in Mount Rainier National Park is dependent largely on the price of labor. The original estimate was based upon the wages that were current in 1903. During the period of construction wages increased from 20 to 33⅓ per cent, on account of which the latter portions of the road constructed were necessarily of less width and consequently less safe than the portion first constructed. An estimate for an additional appropriation of $25,000 was therefore submitted in 1909, for the purpose of widening the road already built, for providing guard walls at dangerous places and for making the road safe and suitable for the traffic which would probably use it. That sum was appropriated by the sundry civil act approved June 25, 1910.

The total amount appropriated to date is $240,000.

The sum of $2,000 was received from surety on defaulted contract.

The amount expended to June 30, 1911, on the project was $233,222.98, of which $17,216.23 were expended for surveys.

The work accomplished under the various appropriations to the close of the fiscal year ending June 30, 1911, was as follows:

Number of miles of road constructed and in use	23
Number of miles of road partially completed	2
Total	25

On account of the small balance of funds available only a limited amount of work was executed during the fiscal year. It consisted of removal of débris from the road, replacing walls, repairing bridges, completing about 1 mile of unfinished roads, and partially completing 1 mile of road. No work was done during the working season of 1912.

As the original appropriation for this work provided for the survey and construction of a *wagon road*, operations have been conducted with the view of providing as good a road of that character as possible for the sum estimated. All work under the project has been completed as far as the funds provided will permit. The road is well located and is suitable for wagon traffic, and it can be readily developed into the broader highway needed for the automobiles and heavy tourist traffic ready to use it. Its present width is too narrow for such traffic and for such use; furthermore, it should be surfaced with road metal throughout the greater part of its length. In the absence of any action by Congress directing that the road be improved for heavier traffic than that contemplated under existing legislation, no estimate for additional work is submitted, and unless legislation is enacted directing that operations under the direction of the Secretary of War be renewed no further report will be presented.

July 1, 1911, balance unexpended	$6,777.02
Received from surety on contract	2,000.00
	8,777.02
June 30, 1912, amount expended during fiscal year	8,747.47
July 1, 1912, balance unexpended	29.55
July 1, 1912, outstanding liabilities	27.72
July 1, 1912, balance available	1.83

Appropriations.

Date	Act.	Amount.
Mar. 3,1903	To enable the Secretary of War to cause a survey to be made for a wagon road in said park and for construction of the road	$10,000
Apr. 28,1904	For continuing the construction of the wagon road, $6,000 of which shall be used in surveying and estimating the cost of a wagon road from the eastern boundary of Mount Rainier Forest Reserve into said park	30,000
June 30,1906	For continuing the construction of the wagon road into the park from the west side	50,000
Mar. 4,1907	do	50,000
May 27,1908	do	50,000
Mar. 4,1909	For completion of the wagon road into the park from the west	25,000
June 25,1910	For additional work upon the wagon road into the park from the west	25,000
	Total	240,000

(See Appendix H H H.)

CRATER LAKE NATIONAL PARK.

Officer in charge, Maj. J. J. Morrow, Corps of Engineers.

The sundry civil appropriation act approved June 25, 1910, contained an item in the following language:

> Crater Lake National Park: For surveying, locating, and preparing plans and estimates for roads and trails in Crater Lake National Park, Oregon, and to cover all expenses incident thereto, to be expended under the direction of the Secretary of War, ten thousand dollars.

The duty of making this survey was assigned to the district officer in charge of the first Portland district July 15, 1910. Two field parties, organized and sent into the park about the middle of August, 1910, continued operations until October 6, when further field work was interrupted by the first heavy fall of snow.

A survey of the nature of a preliminary railroad survey was made covering the road from the entrance to the park on the approach from Klamath Falls up to the crater rim at the present location of the lodge of the Crater Lake Co., and a survey of the proposed road encircling the lake was completed with the exception of a short piece over the cliff near Andersons Spring. Measurement of discharge of all convenient springs was completed. Nearly 50 miles of preliminary lines were run and platted.

During the fiscal year one party, constituted as each of the parties of the preceding season, was sent into the park in July, 1911, under the direction of Junior Engineer W. G. Carroll, and finished the work uncompleted during the preceding season, namely, 6 miles of the 36 miles of road encircling the lake, the 5 miles of road to the Pinnacles, and the 4 miles of road to the eastern boundary of the park. This work comprised about one month of field work. After the return of the field party, in the office, all transit lines were computed and platted, the location was profiled, estimates were completed, and final report submitted November 21, 1911. This report is printed in full with map and profiles in House Document No. 328, Sixty-second Congress, second session. The total estimated cost of the system of roads and trails is $642,000, with an additional $65,000 for a system of tanks and sprinkling, and an annual estimate after completion for maintenance of $20,000.

A complete description of Crater Lake Park is found in Professional Paper No. 3, Department of the Interior, United States Geological Survey, entitled "The Geology and Petrography of Crater Lake National Park," by J. S. Diller and H. B. Patton. Government Printing Office, 1902.

July 1, 1911, balance unexpended	$3,848.91
	3,848.91
June 30, 1912, amount expended during fiscal year	3,365.26
July 1, 1912, balance unexpended	483.65
July 1, 1912, outstanding liabilities	400.00
July 1, 1912, balance available	83.65

(See Appendix I I I.)

NOTE.—OFFICE OF THE CHIEF OF ENGINEERS, U. S. ARMY, *September 30, 1912.*—The sundry civil act approved August 24, 1912, provided an appropriation of $50,000 for expenditure under the direction of the Secretary of War for the construction of a wagon road and the necessary bridges through Crater Lake National Park, together with a system of tanks and water-supply pipes to provide for sprinkling in accordance with the recommendations contained in the report published in House Document No. 328, Sixty-second Congress, second session, referred to above. The total cost of the proposed road and sprinkling system, as given in the estimate published in that document, is $707,000, and it was recommended that an initial appropriation of $100,000 be made to provide plant, shelter, and camp buildings, in addition to a working fund. From the point of view of this office, as much of the work as possible should be completed prior to the San Francisco Exposition of 1915. The season for work in

Crater Lake National Park is very short, and in order to take advantage of climatic conditions and conduct the work economically at the rate of progress desirable the sum of $100,000 should be provided for the season of 1914, to be immediately available and to remain available until expended. An estimate for that amount has therefore been submitted.

RECLAMATION AND DEVELOPMENT OF ANACOSTIA RIVER AND FLATS FROM ANACOSTIA BRIDGE NORTHEAST TO THE DISTRICT LINE, DISTRICT OF COLUMBIA.

The Anacostia River rises in Prince George County, Md., and, flowing 20 miles in a southwesterly direction, joins the Potomac River in the District of Columbia.

The portion included in this project extends from Anacostia Bridge, District of Columbia, upstream 5 miles to the District line. It is subject to a mean tidal oscillation of 3 feet and a maximum rise during freshet to about 12 feet above mean low water.

The channel has not been improved by the United States.

A report on examination of the Anacostia River by S. T. Abert in 1875 states that "in 1835 vessels carrying 100 hogsheads of tobacco, or about 60 tons, were able to load at Bladensburg," but no record of the exact depth at that time is available. In 1862 the minimum channel depth was 18 feet at mean low water at Anacostia Bridge, 12 feet at the Philadelphia, Baltimore & Washington bridge, and 3 feet at Benning Bridge. In 1891 the minimum channel depth was 15 feet at mean low water at Anacostia Bridge, 12 feet at the Philadelphia, Baltimore & Washington Railroad bridge, 8 feet at Benning Bridge, and 3 feet at the District line. The present minimum channel depths are about the same, except near the District line, where the minimum depth is now about 2 feet at mean low water.

The channel is narrow and winding, and between the channel and the banks are extensive flats and marshes which are alternately exposed and flooded by tidal action.

In summer the flats are covered with a rank growth of aquatic plants, which prevent a rapid cleansing movement of the tide and causes deposits of mud and filth. The meadows, which are above ordinary high water level, are flooded at varying intervals, whenever the water is raised by flood or easterly winds above normal level, and every depression retains a stagnant pool, a condition most favorable for the development of malaria.

The acts making appropriations for this work approved March 3, 1911, and June 26, 1912, have provided that the money—

> be expended under the supervision of the Chief of Engineers, United States Army, upon plans to be prepared under the direction of, and to be approved by, a board of engineers to consist of the Engineer Commissioner of the District of Columbia, the officer in charge of public buildings and grounds, and the engineer officer in charge of the improvement of the Potomac River; said sum to be available for the preparation of plans, the prosecution of the work, the employment of personal service, and for such other purposes as may in the judgment of said board be necessary to carry out the purposes of this appropriation.

The necessary surveys having been made, it is proposed to expend the available funds in dredging and construction of river walls in the vicinity of Pennsylvania Avenue Bridge and the line of Massachusetts Avenue extended.

References to examination or survey reports and maps or plans not in project documents.

Section covered.	Congressional documents.				Annual reports of Chief of Engineers.	
	House or Senate.	No.	Congress.	Session.	Year.	Page.
Bladensburg to navy yard [1]	House	94	Forty-fourth	First		
Do [1]					1876	358
Bladensburg to mouth [2]	House	30	Fifty-second	First		
Do [1]					1892	1064
Bridge in line with Massachusetts avenue.[2]	House	140	Fifty-fifth	Second		
Bladensburg to mouth [2]	do	87	do	Third		
Do [1]					1899	1443
District of Columbia line to Philadelphia, Baltimore & Washington R. R. Branch.[2]	Senate	166	Fifty-seventh	First		
Report as to title to riparian lands [2]	House	194	Fifty-ninth	do		
Do [1]	Senate	462	Sixty-first	Second		
Do [2]	do	19	Sixty-second	First		

[1] No maps.

[2] Contains maps.

The board of officers constituted by the act approved March 2, 1911, consisted of Lieut. Col. W. C. Langfitt, Corps of Engineers, United States Army, in charge of the improvement of the Potomac River; Lieut. Col. W. V. Judson, Corps of Engineers, United States Army, Engineer Commisisoner of the District of Columbia; and Col. Spencer Cosby, United States Army, in charge of public buildings and grounds.

After a careful study of the problems involved the board prepared a report upon existing conditions and recommended a complete project for the work.

This project conforms in general with the scheme of development as outlined in the report of the Park Commission (Report of Senate Committee on the District of Columbia, S. No. 166, 57th Cong., 1st sess.) and was approved by the Commission of Fine Arts.

The general features of the proposed project are:

(*a*) The construction of a dam, with lock and necessary appurtenances, on the line of Massachusetts Avenue, to maintain the pool above at a normal elevation of about eight feet above mean low water.

(*b*) The construction of river walls between Anacostia Bridge and the dam, with top of walls at elevation eight feet above mean low water.

(*c*) Dredging the section of river between Anacostia Bridge and the dam.

(*d*) The construction of low walls or gravel beach around the basin from the dam to the District of Columbia line.

(*e*) Dredging the section of river between the dam and the District of Columbia line.

(*f*) The depth of dredging to be such that the excavation and fill will approximately balance.

(*g*) That draw spans be required in Pennsylvania Avenue, Pennsylvania, Baltimore & Washington Railroad, and Bennings Bridges, available width to be 100 feet, as in the present Anacostia Bridge.

(*h*) That the harbor lines above Anacostia Bridge be abolished and the bulkhead line just below Anacostia Bridge be modified as indicated on map.

The estimated cost of the reclamation is $2,046,100.

The operations during the year included a comprehensive study of the situation, including topographical and hydrographic surveys, investigation of stream flow and sedimentation, flood conditions, and sewage pollution.

Plans were in progress for beginning work of construction with Government plant.

The total amount expended on the existing project to June 30, 1912, was $10,115.56.

Anacostia River is navigable for tugs and small vessels to Pennsylvania Avenue Bridge and for small craft to Bladensburg, Md., respectively, 2¾ and 8¾ miles above its mouth.

The amount of commerce above Anacostia Bridge is inconsiderable. It consists almost entirely of gas oil delivered at the works of the Washington Gas Light Co., about 7,900 tons, valued at $76,000, being delivered in 1911.

The board in charge of this work recommends that the additional appropriation and contract authorization recommended be applied to the construction of dam and appurtenances on line of Massachusetts Avenue, construction of river walls, dredging, and reclamation of flats below the dam.

(See Appendix J J J.)

REMOVAL OF WRECK OF U. S. BATTLESHIP "MAINE" FROM THE HARBOR OF HABANA.

The removal of the wreck of the *Maine* from Habana Harbor is being carried on with appropriations aggregating $900,000, made in the acts of May 9 and June 25, 1910; March 4 and December 22, 1911. by a board of engineer officers convened by paragraph 1, Special Orders, No. 36, Office Chief of Engineers, August 2, 1910, consisting of Col. W. M. Black, Lieut. Col. M. M. Patrick, and Maj. H. B. Ferguson.

The project for removing the wreck after first exposing it within a cofferdam was approved by the President October 13, 1910.

In addition to the removal of the wreck it was required: (1) That the remains of the men who went down with the vessel and which had not been recovered should be found if possible and removed to the Arlington National Cemetery for burial; (2) that the mainmast of the ship should be sent to the Arlington Cemetery and there reerected; (3) that the wreck should be so exposed, without derangement of its parts, as to permit all information possible to be obtained as to the nature and location of the explosion or explosions which caused the disaster.

Reports relative to the removal of the wreck and the progress thereof are printed in House Document No. 919, Sixty-first Congress, second session; Senate Document No. 765, Sixty-first Congress, third session; and in Annual Report of the Chief of Engineers, United States Army, for the fiscal year 1911, pages 1119 and 3039. Plan of the locality and photographs of the wreck are included in the last-named document. In November, 1911, the work had progressed sufficiently to permit of the examination of the parts of the wreck as contemplated by Congress and mentioned in the last annual report. (See fourth paragraph, p. 3041, Report of the Chief of Engineers, U. S. Army, 1911.) A report of the board appointed for this duty by the Secretary of the Navy is contained in House Document No. 310, Sixty-second Congress, second session.

The cofferdam was strengthened by placing steel bands around some of the cylinders, by putting in braces, and by banking clay and rock against the interior of the cylinders. Three hundred and four cubic yards of concrete, 16,648 cubic yards of rock, and 5,187 cubic yards of clay were used during the year.

The dam was completely unwatered in October and kept empty until February, during which time the wreck was cleaned of mud and cut in two just forward of frame 41; the intact portion was prepared for floating; the forward portion, as far as possible, was cut into pieces that could be handled by derricks, and the greater portion removed to sea; articles of value were recovered; and the remains of the dead found. The cleaning of the wreck for inspection required the removal of about 5,300 cubic yards of mud.

The remains of 66 bodies were found during the year and sent to Arlington National Cemetery for burial. The mainmast was sent to Arlington Cemetery for erection. The after turret and two 10-inch guns were given to the Cuban Government, and all personal property and other articles of value turned over to the Navy Department.

The after portion of the wreck was floated February 12 and towed to sea and sunk with appropriate ceremonies March 16, 1912.

The work of restoring the site was begun in February. Up to June 30, 42,855 cubic yards of clay and rock, 3,146 steel piles, and 2,050 tons of wreckage had been removed.

Up to June 30, 1912, $696,449.34 had been expended, $110 being received from sales. Work is about 90 per cent completed.

July 1, 1911, balance unexpended	$292,708.11
Received by transfer from other appropriations	1,810.67
Amount appropriated by urgent deficiency act approved Dec. 22, 1911	250,000.00
	544,518.78
June 30, 1912, amount expended during fiscal year, for works of improvement	339,157.45
July 1, 1912, balance unexpended	205,361.33
July 1, 1912, outstanding liabilities	[1] 31,282.80
July 1, 1912, balance available	174,078.53
July 1, 1912, amount covered by uncompleted contracts	60,598.76

(See Appendix K K K.)

MEMORIAL MONUMENT AT FORT RECOVERY, OHIO.

This work was in charge of Maj. John C. Oakes, Corps of Engineers.

The amount appropriated for this work by act approved April 15, 1910, was $25,000.

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[1] Includes $11,000 pledged for erection of mast.

Contract for the construction of the monument was entered into with the Van Amringe Granite Co., of Boston, Mass., under date of February 1, 1912. The design of monument selected is the Egyptian obelisk; it will be 101 feet 4 inches in height above grade and will have at the base of the shaft and in a standing position a granite statue of a frontiersman 9 feet in height. The exterior walls of the shaft will be of granite blocks and the backing of reenforced concrete, with a circular shaft in the center.

During the year the foundation and the lower 18 courses of the shaft were completed.

The total amount expended up to the close of the fiscal year ending June 30, 1912, was $7,145.92.

July 1, 1911, balance unexpended	$24,966.63
June 30, 1912, amount expended during fiscal year	7,112.55
July 1, 1912, balance unexpended	17,854.08
July 1, 1912, outstanding liabilities	75.00
July 1, 1912, balance available	17,779.08
July 1, 1912, amount covered by uncompleted contracts	17,400.00

ERECTION OF MEMORIAL ARCH AT VALLEY FORGE, PA., IN COMMEMORATION OF THE PATRIOTISM DISPLAYED AND SUFFERING ENDURED BY GEN. GEORGE WASHINGTON, HIS OFFICERS, AND MEN DURING THE WINTER OF 1777-78.

This work was in the charge of Maj. Herbert Deakyne, Corps of Engineers.

The act of Congress approved June 25, 1910, authorized the expenditure of $100,000, or so much thereof as may be necessary, for the erection, upon the site of the encampment during the winter of 1777-78, of a memorial arch within the Valley Forge Park. The act also provided that the amount authorized should be expended by the Valley Forge Park Commission under the direction of the Secretary of War, but no appropriation was made for the work.

The sundry civil act of March 4, 1911, made available the amount authorized for this work, and also provided that the money should be expended under the direction of the Secretary of War and by such officer as might be designated by him.

On December 14, 1910, a resolution was adopted by the Valley Forge Park Commission approving the perspective drawings, plans, and specifications submitted by Mr. Paul P. Cret, architect, and directing their submission to the Secretary of War, who gave his approval thereto on March 27, 1911, on condition that it should not be finally effective until contract for the complete erection of the arch within the appropriation of $100,000 should have been awarded.

The site of the arch was under consideration by the Valley Forge Park Commission until May 3, 1911, when the commission finally decided that it would be unwise to make any change in the location originally decided upon at a point near the intersection of the Old Gulph Road and the Outer Boulevard. This site has been approved by the Secretary of War.

A contract was entered into with Mr. Paul P. Cret, under date of May 20, 1911, covering his services as architect for the construction of the arch. Proposals for erecting the arch were invited by advertisement dated October 16, and bids for the work were opened November 15, 1911. Thirteen bidders submitted proposals on 30 granites, the prices ranging from $84,800 to $135,750. Only about seven of the propositions submitted came within the amount of the appropriation available for payment to the contractor.

The suitability for the work under consideration of the granites on which favorable bids were received was investigated, and on March 13, 1912, authority was given by the Secretary of War to award contract for erecting the arch of Milford pink granite to Mr. Henry L. Brown, of Philadelphia, and contract was accordingly entered into on April 4, 1912.

Work under the contract of April 4, 1912, was commenced on May 20, 1912, and at the close of the year excavations for the abutments of the arch were about 78 per cent completed, and models for carving and decorative work were in course of preparation.

Nearly all of the detailed drawings of the arch have been completed by the architect.

The amount expended during the year was $3,285.58, of which $2,730 was paid to the architect, and the balance, $555.58, covered superintendence, office, and incidental expenses.

Amount appropriated by the sundry civil act of Mar. 4, 1911		$100,000.00
Amount received from sale of blue prints		69.00
Total		100,069.00
June 30, 1911, amount expended during last fiscal year	$29.64	
June 30, 1912, amount expended during present fiscal year	3,285.58	
		3,315.22
July 1, 1912, balance unexpended		96,753.78
July 1, 1912, outstanding liabilities		1.00
July 1, 1912, balance available		96,752.78
July 1, 1912, amount covered by uncompleted contracts		93,730.00

CONTRACTS IN FORCE.

COVERING SERVICES OF THE ARCHITECT.

Contractor: Paul P. Cret.
Date of contract: May 20, 1911.
Date of approval: June 15, 1911.
Consideration of contract: $5,460.

FOR ERECTING THE MEMORIAL ARCH.

Contractor: Henry L. Brown.
Date of contract: April 4, 1912.
Date of approval: April 13, 1912.
Date of commencement: May 20, 1912.
Date of completion: October 18, 1913.
Consideration of contract: $91,000.
Completed at close of fiscal year: 0.64 per cent.

ERECTION OF MONUMENT TO COMMEMORATE THE BATTLE OF GUILFORD COURTHOUSE, N. C., AND IN MEMORY OF MAJ. GEN. NATHANAEL GREENE AND THE OFFICERS AND SOLDIERS OF THE CONTINENTAL ARMY WHO PARTICIPATED WITH HIM IN THE BATTLE OF GUILFORD COURTHOUSE.

This work was in charge of Capt. Earl I. Brown, Corps of Engineers, from July 1 to July 8, 1911; in temporary charge of Capt. L. H. Rand, Corps of Engineers, from July 8, to December 11, 1911; and in charge of Maj. H. W. Stickle, Corps of Engineers, since December 11, 1911.

By act of Congress, approved February 13, 1911, the sum of $30,000 was authorized to be appropriated for the erection of a monument on the battle field of Guilford Courthouse, Guilford County, N. C., to commemorate the battle fought there on March 15, 1781, by the American forces, commanded by Maj. Gen. Nathanael Greene, and in memory of Maj. Gen. Nathanael Greene and the officers and soldiers of the Continental Army who participated in the battle of Guilford Courthouse. The appropriation of the $30,000 for this purpose was contained in the sundry civil appropriation act, approved March 4, 1911, which provided that the funds should be expended under the direction of the Secretary of War and by such officer as might be designated by him.

Models from competing sculptors were received during the year and three models were selected as most meritorious. These were: Model No. 5, submitted by F. H. Packer; model No. 2, submitted by Augustus Lukeman; and model No. 10, submitted by Henry H. Kitson.

From the three models chosen a selection was made of model No. 5. The award of the contract was made to Mr. Packer after a modification of the architectural setting of his model was made by him and approved by the Secretary of War. Contract price, $27,500.

A contract was in course of preparation at the close of the fiscal year.

Balance unexpended at end of previous fiscal year	$30,000.00
Amount expended during the fiscal year	871.63
Balance unexpended at end of fiscal year	29,128.37
(In Treasury United States, $29,000; in hand, $128.37.)	
Outstanding liabilities	.70
Balance available at end of fiscal year	29,127.67
The expenditures for the year were as follows:	
Office expenses	321.63
Honorarium paid Augustus Lukeman, sculptor	300.00
Honorarium paid Henry H. Kitson, sculptor	250.00
	871.63

OFFICE OF THE CHIEF OF ENGINEERS.

During the fiscal year ending June 30, 1912, the following-named officers were on duty in this office as assistants: Col. Edward Burr; Lieut. Col. Harry Taylor; Maj. Edgar Jadwin from December 15, 1911; Maj. James B. Cavanaugh until July 20, 1911; Maj. William B.

Ladue; Capt. Edward N. Johnston; Capt. Robert R. Ralston; First Lieut. Charles K. Rockwell.

The Chief of Engineers has received from the civilian employees of the office most loyal and efficient support and assistance in the transaction of the duties devolving upon him, and takes this opportunity to express the hope that some provision will speedily be made for their financial relief when they become superannuated in the public service, to which many of them have devoted the best years of their lives, the salaries of the office clerks as fixed by law, and practically unchanged for 50 years, being too small, excepting in rare instances, to permit such accumulation as will provide for their support when they become incapacitated for active duty.

W. H. Bixby,
Chief of Engineers, U. S. Army.

The Secretary of War.

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